Environmental Literacy of Peruvian Middle School Graders and Their Teachers of Private and Public Schools

Environmental Literacy of Peruvian Middle School Graders and their Teachers of Private and Public Schools

Sandra Elizabeth Huaman Pastorelli

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Abstract

With a world population of 7.8 billion people, limited natural resources, and pollution that grows day by day in an exorbitant way, we need to learn to live together sustainably. The most efficient way is through environmental education (EE) focusing on the Sustainable Development Goals (SDGs), basically SDG # 4, "quality education". In Peru, EE has been working for years, however quantitative evaluations have not been the priority focus. Considering that these evaluations are necessary, the purpose of this research was to contribute quantitative analysis based on data collected in primary schools in Peru, and to provide a methodological tool that could be used in other studies. To address this purpose, students of fifth and sixth grade and their teachers were selected, as well as the five dimensions proposed by AKASA model.

This research assessed four hypotheses predicting relationships between students' and their teachers' environmental literacy and its dimensions (awareness, knowledge, attitude, skills, and action), comparing public and private school in Metropolitan Lima area, the capital of Peru.

The primary data were collected in spring 2019, through a structured questionnaire, the Peruvian Environmental Literacy Assessing tool – PELAT, adapted from the Middle School Environmental Literacy Instrument (MSELI) which surveyed 1396 students (645 in fifth grade and 751 in sixth grade) and 33 teachers (16 in fifth grade and 17 in sixth grade) from 18 schools (11 public and 7 private) from seven Local Educational Management Units of Metropolitan Lima area. The data were analyzed using

a descriptive-correlational design. I expected to find significant positive correlations between the students and teachers in fifth and sixth grade of public and private schools.

In general, the results showed that 78% and 74% of 5th and 6th grade students, respectively, have a medium level of environmental literacy, there being a significant mid-level relationship between fifth and sixth grade students. In addition, I found that 81% and 76% of teachers in fifth and sixth grade respectively have a high level of environmental literacy, with a significant high-level relationship between teachers of both grades. All hypotheses were supported, with significant relationships between the environmental literacy of 5th and 6th grade students at primary school and their teachers.

For future studies, I recommend making PELAT available as an instrument to be adapted in each interested region/school, whether at the national and/or Latin-American level. Results from these assessments would make it more feasible to analyze in depth the actions to be carried out at the pedagogical and environmental level that allows raising the levels of environmental literacy.

Author's Biographical Sketch

Sandra Elizabeth Huaman Pastorelli is a Doctor in Education, holds a master's in production engineering from the Federal Fluminense University in Brazil. She has a double major in economics and education specializing in environmental sustainability, social innovation, and participates in advice and thesis jury, research applied to social sciences, and scientific knowledge management and production of articles for indexed journals. She is a trilingual researcher, with 13 years of teaching experience and 15 years of experience in the industrial, management and service areas.

She is Professor at the University of San Martín de Porres in the courses of applied business research and Social Innovation Coordinator of Development and Technological Innovation Center. She is also a national and international speaker on issues of environmental education, green buildings, and scientific methodology (Concytec researcher, Orcid Nro 0000-0003-3753-8923).

Dedication

To my son, who has taught me to be free ... I will love you forever, my only true love. We did it, we are a team.

To my parents, for raising me to believe that anything is possible with dedication and integrity.

To my grandparents, for being my first editors and giving me the best written advice: LOVE.

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Chapter I

Introduction

Many countries based their environmental agenda on the eradication of poverty, the fight against climate change, the preservation of species and resources (water, soil, and energy), and the reduction of the most ambitious inequalities ever adopted by the international community. The United Nations (2015) has compiled statistics from 194 member states focusing on the Sustainable Development Goals (SDG), which are a universal call to end poverty, protect the planet, and ensure that all people enjoy peace and prosperity by 2030.

In addition, WHO (2019) states that air pollution is mainly derived from the combustion of fossil fuels, inefficient industrial processes, waste incineration, old fashioned agricultural practices and natural processes such as forest fires, dust storms and volcanic eruptions. Therefore, air pollution is a global public health crisis, because exposure to air pollutants threatens the health of people of all ages, in all parts of the world, both in urban and rural areas, affecting the most vulnerable among us, children, in unique ways.

Regarding air pollution, WHO (2016) concluded that exposure to air pollution is a health emergency that goes unnoticed by children around the world. While such exposure is a persistent problem in some high-income countries, most child deaths from exposure to air pollution by particles are generated in low-middle-income countries. Children of all ages are at a higher risk than adults due to the numerous adverse health effects of air

pollution, including a combination of behavioral, environmental, and physiological factors. In addition, they breathe faster than adults, absorbing more air and, with it, more pollutants. Children live closer to the ground, where some pollutants reach maximum concentrations. They can spend a lot of time outside, playing and doing physical activity in potentially polluted air. Their bodies, and especially their lungs, develop rapidly and, therefore, are more vulnerable to inflammation and other damage caused by contaminants. But children depend entirely on us, adults, to protect them from the threat of unsafe air, because as adults we have a responsibility to find alternative solutions.

Peru's centralist policy historically, has located Lima as a node that consumes most of its resources, has always been the center of attraction of migration from the countryside to the city because it offers better life expectations, including health and education, compared to the reality of other places in the rest of the country.

Santa Gadea (2013), from a climate perspective, points out that the Latin American and Caribbean region, and especially Lima, has a challenge to establish various strategies for the effects of adaptation and mitigation. One of the most important long-term strategies is environmental education. Thus, Peru, in its characteristics of informal governance, with a state policy that privileges even the extraction of minerals and extractive activities, is required to implement environmental education to establish the links between the ecological, socio-cultural and economic components, as well as face the deterioration of the environment.

In that sense, the Peruvian Ministry of Education (Ministerio de Educación (MINEDU) (2012) approved the National Environmental Education Policy by Supreme Decree No. 017-2012-ED. This national policy is the instrument that provides the specific

and instrumental guidelines necessary for the implementation of the National Environmental Education Policy and compliance standards. Likewise, its general objective is to develop environmental education and culture, oriented towards the formation of an environmentally responsible citizenship and a sustainable, competitive, inclusive and identity Peruvian society. The environmental approach is applied through the formal and non-formal education system, as well as the economic and social dynamics of the national public and private sector.

After four years, MINEDU (2016) in close collaboration with the Ministry of Environment (Ministerio del Ambiente (MINAM) developed the National Environmental Education Plan (Plan Nacional de Educación Ambiental (PLANEA) 2015-2021 approving it in the framework of the 2030 Agenda for Sustainable Development. PLANEA's mission is to promote environmental education and culture that allows the formation of environmentally responsible citizens who contribute to sustainable development and address climate change at local, regional, and national levels. To do this, it specifies the efforts and commitments of different public and private institutions and organizations that, working under the creative and integrative knowledge dialogue and respecting the gender and intercultural approach, manage to maintain and implement innovative educational and communication practices to build a sustainable society, competitive, inclusive and with identity. It is important to note that PLANEA formulated three strategic axis (EE): educational community competencies for healthy and sustainable lifestyles (EE1), citizen commitment to sustainable development (EE2), and institutional commitments for development and sustainable societies under the strategic axis (EE3).

Likewise, PLANEA mentions that it is a challenge for the country to achieve a "high degree of environmental awareness and culture" or an "appropriate environmental culture" via a participatory, multiscenary and transgenerational educational process. It then proposes a pedagogical strategy that forms environmental values in the classroom, school and, above all, in community life. Education should contribute to training Peruvians as citizens capable of: a) critically think on their environment and the country; b) commit to sustainable development and the improvement of our society, and c) build a democratic, inclusive and wellbeing system for all (MINEDU, 2016)

In Peru, environmental education is formulated in the Basic Education Curriculum of Peru (MINEDU, 2016a) as part of its seven transversal approaches, mainly in the cross-sectional approach number five called the environmental approach. The environmental approach indicates that the educational processes are oriented towards the formation of people with critical and collective awareness about the environmental problem and the condition of climate change at local and global level, as well as about their relationship with poverty and social inequality. In addition, it involves developing practices related to the conservation of biodiversity, soil and air, the sustainable use of energy and water, the valuation of services provided by nature and terrestrial and marine ecosystems, the promotion of patterns of responsible production and consumption and the proper management of solid waste, the promotion of health and well-being, adaptation to climate change and disaster risk management and, finally, to develop healthy and sustainable lifestyles.

The Basic Education Curriculum of Peru (MINEDU, 2016a) concludes that where the implementation of the environmental education has begun is elementary school, it is

therefore important to monitor how these processes are being developed to propose trends in the medium and long term.

MINAM (2014) has retaken the Global Learning and Observation to Benefit the Environment (GLOBE) Program in 2012 as a valuable tool to promote environmental culture in schools and promote participation in the solution of problems associated with climate phenomena, the management of water resources and biodiversity management. GLOBE is promoted worldwide by international scientific institutions such as the National Aeronautics and Space Administration (NASA), the National Oceanographic Administration and Atmospheric (NOAA), the University Corporation for Atmospheric Research (UCAR) among others, and is aimed at primary and secondary level educational institutions. It was established in 1995 and has the participation of more than 30,000 teachers from around 30,000 schools in 119 countries until January 2018.

In Peru, more than 50 schools nationwide are participating, and students advised by their teachers monitor a series of environmental variables. For example, they track the evolution of weather, building a database from it. Then they carry out research using these data, interpreting and relating it to other events or phenomena happening in their local environment. Research results are disseminated and made available to the community nationally and worldwide. This also promotes the development of future scientific vocations in students. In order to make the GLOBE Peru Program sustainable, it is necessary to empower schools, professors and teachers in scientific practice and environmental research, to encourage regional and local governments aware as well as to environmental promoters to support this initiative, generating alliances with the private sector committed to the development of environmental sciences in the country.

For Peruvians to be aware of the importance of caring the planet, the mandatory starting point is to increase the awareness, knowledge, attitude, skills, and action (AKASA model) of children and teachers in relation to environmental problems. In addition, Peruvian students between 11 and 12 years old, who study in fifth and sixth grade (these grades represent cycle V) of primary school prioritize interdisciplinary learning.

For Piaget (1972), this happens because students between the ages of 11 and 12 will soon have a transition from elementary school to high school, so they must develop their ability to reason independently and hypothetically. Goswani (2001) also states that children, especially those from 6 to 12 years old, learn new skills and try to "obtain recognition by producing things" that have been able to generate a satisfactory experience.

Based on this background, Latin American cities, including Lima, should develop an action plan with the objective of promoting environmental education to enable their citizens to contribute to reducing pollution, due to its negative effects on global warming.

Research Significance and Objectives

The results of environmental literacy obtained in this research will be useful since there are a very few studies of this issue at national and regional levels. This research will be the beginning of the application of new surveys to measure the environmental awareness in educational training and become an effective and useful tool for teachers and students. In the Peruvian case, given its high biodiversity and diverse ecosystems, and although its environmental challenges or problems are widespread, differentiation or

reliability will go hand in hand with awareness and knowledge of teacher-student issues. Therefore, the Middle School Environmental Literacy Instrument (MSELI) surveys which have been adapted for this study are referential and will change according to target groups and their ecosystems.

The broad objective of this research was to determine the relationship between the environmental literacy of students and teachers of fifth and sixth grade of public and private schools in Metropolitan Lima (ML) area.

Specific objectives depended on the dimensions of environmental literacy considered, and were to:

1. Determine the relationship between the environmental awareness, knowledge and attitudes of students and teachers in fifth and sixth grade of private and public schools in ML.
2. Determine the relationship between the skills and environmental actions of students and teachers in fifth and sixth grade of private and public schools of ML.

Background

With a world population of 7.8 billion people and limited natural resources we need to learn to live together in a sustainable way. We must act responsibly based on the understanding that what we do today may have implications in the lives of people and the planet in the future.

Education for Sustainable Development (ESD) empowers people to change their thinking and work towards a sustainable future. There is a growing international recognition of ESD as an integral element of quality education and a key facilitator of

sustainable development. The SDGs adopted by the world community for the next 15 years include ESD (United Nations, 2015).

The SDG 4, "quality education", explains that it is important to ensure inclusive, equitable and quality education and promote lifelong learning opportunities for all (United Nations, 2015). This means that the improvement of life quality is directly correlated with an inclusive and creative educational training, providing people with appropriate instruments to face environmental challenges.

This objective is based on the diagnosis that there are more than 265 million children out of school, 22% of whom are of primary school age. And children who attend school lack fundamental reading and math skills. The absence of quality education is due to the lack of duly qualified educators, poor school circumstances and equity problems related to the possibilities of rural children. The advances produced during the last century have not been sufficient and investment in academic scholarships, teacher training courses, classroom construction and improvement of water and energy access to schools is required to provide quality education to children in poor homes.

SDG 4 has established as a priority measure that, by 2030, all women and children must complete primary education; that there must be a free, fair and high-quality primary and secondary education; and that students must acquire the knowledge and skills necessary to promote sustainable development, including, but not limited to, education for sustainable development and lifestyles, human rights, gender equality, the promotion of a culture of peace and nonviolence, global citizenship and appreciation of cultural diversity and the contribution of culture to sustainable development. Further, that there must be a significant increase in the availability of qualified educators,

including global collaboration for teacher training in emerging nations, least developed countries and small island developing countries (United Nations, 2015).

In that context, ESD empowers people to change their thinking and work towards a sustainable future. The United Nations Educational, Scientific, and Cultural Organization (Unesco, 2017) has an objective of improving access to quality sustainable development education at all levels and in all social contexts, to transform society by reorienting education and help people develop the knowledge, skills, values and behaviors necessary for sustainable development. In addition to including sustainable development issues, such as climate change and biodiversity, in teaching and learning, Unesco encourages individuals to be responsible actors who solve challenges and respect cultural diversity and contribute to creating a more sustainable world.

Environmental Education (EE)

EE has become a focus of global attention because it must demonstrate how to mitigate and adapt to expected climate changes. Commonly, this definition is known as education for sustainability (ES) or education for sustainable development (ESD) worldwide (Unesco, 2017).

Martin (1975, p. 16) defined environmental education as "a process of identifying values and concepts to develop skills and attitudes necessary to understand and appreciate the interrelation between man, his culture and his biophysical environment". In his opinion, this "implies practice in decision-making and self-formulation of a code of conduct on issues related to environmental quality".

Ernst and Monroe (2006) argued that environmental education is the continuous

process of development of human beings, in which they are concerned about global environmental problems, and that they have awareness, attitudes, knowledge, skills and actions to find solutions to contemporary problems.

Lane, Wilke, Champeau and Sivek (1994) pointed out that the National American Association of Environmental Education (NAAEE) at the United Nations Intergovernmental Conference on Environmental Education in Tbilisi, Georgia, developed a variety of documents which defined fundamental concepts for EE. Several organizations and institutions have used these concepts. In addition, the Tbilisi Declaration specified that EE should help people actively resolve problems within their communities, encouraging them to feel a sense of responsibility and commitment to prevent future environmental disasters.

UNESCO (1977, p 1) considers that the objectives of the EE are the following:

> (1) foster a clear awareness of economic, social, political and ecological situations in different areas; (2) provide each person with opportunities to acquire knowledge, values, attitudes, awareness and skills to protect and improve their environment; (3) create new patterns of behavior of individuals, groups and society related to the environment.

Various environmental educators defined the main objective of EE is to develop a population with knowledge, skills, attitudes, motivation and awareness to work together for current environmental problems and their prevention, validated in a prototype Curriculum, designed to support people in the development of environmental literacy in students and teachers.

Similarly, UNESCO (1997, p. 26-27) summarizes the components linked to EE in three dimensions: “(1) education about the environment (knowledge), (2) education for the environment (values, attitudes and positive actions) and (3) education through the

environment (a resource)."

Liu and Guo (2018) argued that global environmental problems are getting worse and the promotion of environmental education is a critical way to improve human environmental literacy and solve their environmental problems. People have paid more attention to environmental education or environmental problems in management education, hoping to enrich people's environmental knowledge and environmental value through environmental education to change people's attitudes.

Environmental Education in Latin America

Gonzales-Gaudiano and Lorenzetti (2009) argued that, in the case of Brazil and Mexico, the increasing number of postgraduates in EE, both in master's and doctoral level research, have contributed significantly to research in this field. A similar situation occurs in Colombia, Venezuela, and Cuba, although in smaller numbers.

In Mexico, every two years EE conferences are organized around the National Academy of Environmental Education (Asociación Nacional de Educación Ambiental - ANEA), created in 2000 (Avanzi & Silva, 2004). The Environmental Education magazine issues a study every ten years of the state of knowledge of each of the areas recognized by the Mexican Council of Educational Research, and there is an institutional and political position about it.

Gonzales-Gaudiano and Lorenzetti (2009) deduced from this initial process the need to establish better access to the field of research in EE, not only through training strategies for researchers, so that they can have a theoretical and methodological training that enable them to go beyond the systematization of their experience, as well as trying to

establish a research agenda aimed at coordinating researchers into specific areas and problems.

The central theme of EE research in this area is the different levels and modalities, which is paradoxical because the field of EE in Mexico and other Latin American countries, with the necessary changes, are hardly institutionalized (González-Gaudiano, 2007).

In Brazil, the state of knowledge in EE can be delineated by existing research. In addition, there is a diversification of events around the subject, but the focus is on the research group "environmental issues and the educational process". Since 2001, several universities in the state of São Paulo have joined this group every two year to provide publications in the journal Research in Environmental Education (Gonzales-Gaudiano and Lorenzetti, 2009).

EE in Brazil can be analyzed in different ways; among them, the analysis of academic production studies, represented by dissertations. These are essential because they contribute to the process of understanding the establishment of this field of knowledge. Through these studies it is possible to identify research trends, recognizing those developed in the school context. The analysis in EE in Brazil began in the 1980s, when the first master's thesis was produced in the country, as Lorenzetti (2009) points out.

Gonzales-Gaudiano and Lorenzetti (2009) argue that in Colombia, the field of EE has progressed towards the sustainable development of education. Consequently, the Ministry of National Education developed school environmental projects (Proyectos Ambientales Escolares -PRAES). There has been little research in the field of EE, despite

ten-year EE plans, which should have been implemented by law between 2005 and 2014. Those were proposed to make a research diagnosis of what EE was since its start in Colombia, but, as with PRAES, there is a tendency to implement education to develop sustainable development in these plans.

Except for very isolated research, such as those promoted at the National University of Colombia, especially the Institute of Environmental Studies, which carried out a very critical review of the way in which EE has been taken in Colombia (Angel, 2000; Noguera, 2004), the other environmental education studies are oriented towards sustainable development.

Peruvian Basic Education and EE

MINEDU (2016) visualizes and shapes the rights of students to learn in response to the current challenges and the various needs, interests, aspirations, values and ways of thinking, to interconnect with the environment and ways of life valued by Peruvian society and considers that, in Peru, there is little support for EE goals in the school curriculum.

The implementation of the different learning purposes in the Peruvian curriculum has seven interdisciplinary approaches on which the environmental approach is based. This transversal approach provides general conceptions about people, their relationship with others, with the environment and with shared space. This is transformed into specific ways of acting, constituting values and attitudes that students and teachers should strive to demonstrate in school activities.

In addition, MINEDU (2016a) has the PLANEA 2017-2022, an instrument of

governance developed through an extensive process of analysis, participation and national consultation led by MINEDU and MINAM with the active participation of public sector entities and civil society. PLANEA was implemented at the national level and has the participation of several sectors of the three levels of government (national, regional and local), the private sector, civil society organizations and citizens.

In the last four decades, four non-governmental organizations have developed case studies in the departments of Lima and Cuzco, highlighting environmental activities, solutions through participatory processes with the communities involved, and conclusions from their work.

EE case studies in Peru

In Peru, there are few organizations which focused on developed EE, for example:

1. International Development Cooperation (IDC) involved Peru in promoting EE, as part of a three-year project funded by the European Community. This project provided support to four non-governmental organizations that work to promote EE and ESD in Lima and Cuzco (Chauvin, 2000) as follows:

- In San Mateo, the Office of Environmental Assistance and Consulting (Oficina de Asistencia y Consultoria Ambiental - OACA) has developed several projects since 1992, which included the construction of a sustainable economic, social and environmental model, which allowed it to change its approach to work along the Rímac river basin located in the district of San Mateo, province of Huarochiri, about 100 kilometers north of Lima.
- The Latin American Forum of Environmental Sciences (Foro Latinoamericano de

Ciencias Ambientales - FLACAM) has developed several projects since 1992, part of which has been the "Valle Verde" project in Lima. Zucchetti (as cited in Chauvin, 2000) stated that the activities of this office involve building sustainable environmental education and strengthening the community ability to manage their development in schools and community organizations.

- The Pukllasunchis Association (founded in 1981 in Cuzco) focused on educational proposals to transform the public education sector for the benefit of the poor, Quechua-speakers, and urban areas of the city. They started with preparatory schools for children from ages 3 to 12. This association has three fundamental pillars: (a) intercultural learning, (b) gender, (c) the environment that crosses the existing curriculum in all learning areas. The main objective was to develop a curriculum that included an environmental dimension that defined the contents, objectives and methodologies in each grade. Project beneficiaries include science teachers and more than six hundred students from rural areas.
- The Center for Educational Research and Development (Centro de Investigación y Desarrollo Educativo - CERD) developed the Green Schools Project over four decades. It operated an experimental school in Lima, the José Antonio Encinas School, and has a contract with the Peruvian government to offer education programs in democracy and the environment as part of the National Teacher Training Plan (Plan Nacional de Capacitacion Docente-PLANCAD). CERD has been working with PLANCAD since 1996. It is about involving our students in the environmental education process, without overloading teaching activities. This implies that environmental education becomes part of the daily educational

practice.

2. The Peruvian Association for the Conservation of Nature (Asociacion Peruana para la Conservacion de la Naturaleza - APECO), is one of the first NGOs created in 1980, with a new and unique objective at that time, EE. APECO worked extensively in the three lines of EE: the informal one, through the media; the non-formal one, focused on organized groups of our society; and the formal one, focused on the formal educational system at its different levels (authorities, teachers and students).

In preparation for the EE program, APECO carried out a National Conservation Campaign for almost three years with the motto "Conserve nature to live better." The campaign consisted of EE activities of the three lines that reached 18 places in the country in each one of which formed a sister organization that would be responsible for replicating all the actions of EE in its area. Subsequently, informal work was conducted independently with the media; non-formal for youth groups and diverse authorities; and formal ones aimed at teachers and students of public and private schools in the 18 areas. The formal EE was conducted in the form of comprehensive and interdisciplinary packages inspired by the Waldorf pedagogy created by Rudolf Steiner (Richards, 1980).

These educational packages included in each case activities that appealed to the three basic animating qualities of the recipients: thinking (scientific knowledge), feeling (artistic expressions), and acting (specific projects and actions in favor of the environment). To enhance the formal EE program, the so-called T´ikay Wasi program (house of flowering in Quechua) was created. The

T´ikay Wasi methodology is applied in workshops which are part of the different institutional programs and projects, dealing with issues such as livestock in the high jungle of the Rio Abiseo National Park; sensitization of teachers in Chancay, Huaral and Huacho to promote guided visits to the Lachay National Reserve; teacher training for the guidance to the Interpretation Center of Chigualén; among others. T´ikay Wasi acted in the form of courses organized in three formats according to their duration: complete courses of three months of resident and a school year of distance, a modular course for teachers of Pedagogical Institutes of one month of resident, and a distance school year. Specific courses were also given with this modality for teachers in areas close to Natural Protected Areas. These courses were made in agreement with the Ministry of Education and its corresponding Local Educational Management Unit (in Spanish, Unidad de Gestion Educativa Local – UGEL), in each area of the sister organizations, as well as with the academic support of the National Agrarian University, La Molina.

The training in EE was oriented to teachers of any level or any subject that had interest, disposition, and formal support of their authorities, to pass through the resident stage and the distance stage. The resident stage consisted of courses in ecology, art, and alternatives of ecological action. The distance stage consisted of the replication of the program in the schools of the participating teachers: Replication with their colleagues and replication with their students. The difference in replication consisted of the pedagogical approach according to the age of students, based again on the methodology of Waldorf Pedagogy. In young

people and adults, the process went from knowledge to environmental action previously moralized by feeling. In young students the integral process goes from action to feeling to knowledge; in those of primary sentiment to action and knowledge. Hundreds of teachers from all over Peru were trained by this program. Thousands of teachers received the multiplier effect and hundreds of thousands of children received EE and acted in the so-called "mini-project" in favor of their environments.

Environmental Literacy (EL)

Roth (1992) defined the term environmental literacy (EL), and after several revisions, Dinsinger and Roth (1992) defined a person's environmental literacy, as it relates their values to knowledge to generate action.

O'Brien (2007, p. 13) defined environmental literacy as the set of "understandings, skills, attitudes and mental habits that enables people to relate positively to their environment and to take daily and long-term actions to maintain or restore sustainable relationships with other people and the biosphere". And he believes that the essence of EL is the way in which people "respond to the questions we learn to ask about our world and our relationship with it; the ways we search and find answers to those questions; and the ways we use the solutions we have seen. "

The five components proposed in the Tbilisi Declaration should be attributed to someone who is considered environmentally literate. These components are independent and Elder (2003) uses this model to illustrate his process to achieve EL. This Declaration established five dimensions from which the goals and objectives in the US should be

oriented, collectively called the Akasa model:

1. Awareness: to help social groups and people to acquire awareness and sensitivity towards the total environment and their allied problems.
2. Knowledge: to help social groups and individuals acquire a variety of experiences and acquire a basic understanding of the environment and its associated problems.
3. Attitudes: to help social groups and individuals to acquire a set of values and feelings of concern for the environment and motivation to actively participate in the improvement and protection of the environment.
4. Skills and action: to help social groups and people to acquire the skills to identify and solve environmental problems and an opportunity to actively participate at all levels in the work towards solving environmental problems.

Previous Research on Environmental Literacy in Worldwide Schools

There are many models and constructions created to measure environmental literacy throughout the world. Mifsud (2012) compiled varied information from various documents on the behavior, attitude, or levels of knowledge of students from different ages and countries in middle schools through a quantitative methodology (Table 1).

These research were carried out on fifth and sixth grade students in different countries. The use of a quantitative methodology and different instruments (surveys) provide researchers with the resources to predict the relationships and gaps between levels of environmental literacy.

Eagles and Demare (1999) demonstrated, in early research of 6th grade Canadian students, that environmentalist and moralistic attitudes towards the environment

Table 1. EL studies of individual regions or countries (adapted from Mifsud, 2012, results column added by author).

Author	Country	Sample derived from	Sample size	Results
Eagles and Demare (1999)	Canada	The 6th-grade students	72	Environmental ecologist and moralistic attitudes correlated positively with family, media, and school environmental education influences
Alp, Ertepinar, Tekkaya, and Yilmaz (2006)	Turkey	6th to 10th -grade students	1,977	A statistically significant effect of grade level was found in environmental knowledge and attitudes.
Negev, Sagy, Garb, Salzberg, and Tal (2008)	Israel	The 6th and 12th-grade students	3,121	Environmental knowledge correlated with somewhat decreased environmental behavior. attitudes and behavior did not differ significantly by socioeconomic status.
Alaydin, Demirel, Altin, and Altin (2014)	Turkey	3rd and 4th-grade students	130	Parents´ low/higher income and education level is positively correlated with students' higher/low environmental and recycling level awareness.
Karpudewan M., Roth W. and Syahrir Bin Abdullah M. (2015)	Malaysia	11 years old students	55	The non-significant relationship was identified between knowledge and attitude

correlated with talking about the environment at home, watching movies and reading about the environment. These students did not have a previous EE program, but they traveled to a Young Men's Christian Association (YMCA) camp before their teachers administered the survey. The results showed that there was a positive correlation between the student's environmental participation and the environmental attitude score. However, these data do not represent whether attitudes preceded the behavior, or if participation in the YMCA activity created the attitude.

Alp, Ertepinar, Tekkaya and Yilmaz (2006) studied the knowledge and environmental attitudes of 6th to 10th grade students in Turkey using the Children's Environmental Attitude and Knowledge Scales (CHEAKS) as the main instrument for collecting data. They found that, although the effect of gender on attitudes was statistically significant in favor of women, the gender difference in environmental knowledge was not substantial. Therefore, girls had more favorable behavior intentions, environmentally responsible behaviors and effects. On the other hand, age was negatively related to environmentally responsible behaviors, but the impact of age on environmental knowledge was positive. Finally, a different result was that students of higher-grade level had significantly higher levels of knowledge of environmental problems, and positive attitudes towards the environment decreased by grade level.

Negev, Sagy, Garb, Salzberg, and Tal (2008) conducted a national survey in Israel to 6th and 12th grade students to assess their environmental literacy, including correlations between these different dimensions and their associations with demographic and experimental data. They used high school environmental literacy, the high school environmental literacy instrument and the Goldman, Yavetz, and Pe'er (2006) teacher-student instrument. They found no significant correlation between knowledge and behavior. Ethnic and socioeconomic characteristics were moderately associated with environmental literacy, while the presence of an adult who promoted the relationship of children with nature was strongly related to attitudes and environmental behavior and weakly related to knowledge. By 12th grade, there was no significant correlation between knowledge and behavior, while there were moderate correlations between the attitudes and knowledge of those students. Finally, for the sixth grade, environmental knowledge

and environmental behavior were not significantly correlated. However, the correlation between attitude and knowledge among 6th grade students was twice as high as that of 12th grade students. Finally, for grades 6 and 12, general environmental performance scores were not related to environmental knowledge scores and were negatively related to knowledge in a multivariate regression that included attitudes. Environmental behavior was strongly related to attitudes in the 12th grade and was moderately associated with it in the 6th grade. Attitudes and knowledge were strongly related in the 6th grade and reasonably related in the 12th grade. Except for a question in the sixth grade, they did not find a single knowledge question that is related to behavioral scores. In summary, their findings reveal substantial gaps in environmental knowledge and a significant decline in environmental behavior among Israeli high school students.

Alaydin, Demirel, Altin and Altin (2014) analyzed the levels of knowledge and skills of primary school students at different social and economic levels in Turkey about waste recycling and their levels of participation in recycling activities. In addition, this study evaluated the impact of parents' socioeconomic structures and the state of education on their environmental awareness. The research showed that most students who had a course on environmental issues at school reported that environmental issues would be one of the most critical questions they will face. Those students would not have a solid ecological background if they had no EE. In conclusion, despite low-income levels and parents with low levels of education, environmental awareness and recycling was higher than expected at school with a low-income neighborhood. In schools located at a medium socioeconomic level, students were less aware of environmental problems and recycling than students of a lower socioeconomic level.

Karpudewan, Roth and Syahrir Bin Abdullah (2015) tested the effect that child-centered climate change activities based on the 5E learning cycle would have on the more traditional activities of teachers in primary school students in Malaysia (11 years old). A quasi-experimental design was used, which included a treatment and a group that represented a typical teaching method, to measure the effectiveness of these activities in (a) increasing children's knowledge about global warming, (b) changing their attitudes to be more favorable towards the environment, and (c) identify the relationship between knowledge and attitude that existed in this study. Statistically significant differences were detected in favor of the treatment group for both knowledge and environmental attitudes, but there was no relationship between knowledge and attitude. The researchers found a significant effect in the treatment group in the understanding of global warming, and attitudes towards the environment as measured by the New Ecological Paradigm (NEP) Scale for children. In conclusion, the results showed that the treatment seemed to have helped students understand the problems related to global warming. Finally, it is important to note that these researches demonstrated with quantitative studies the real gaps between students' environmental knowledge and their behavior and attitude.

Research Questions, Hypotheses and Specific Aims

The broad research question addressed by my research was: What is the relationship between students' environmental literacy and their fifth and sixth grade teachers of public and private schools in Metropolitan Lima area (ML)? The general hypothesis I examined was: There is a significant relationship between the environmental literacy of students and teachers of fifth and sixth grade of public and private schools in

Metropolitan Lima (ML). Specifically, I expected to find significant positive correlations between the students and teachers in fifth and sixth grade of public and private schools in ML, in:

H1: environmental awareness,

H2: environmental knowledge,and

H3: environmental attitude.

Finally, I asked what is the relationship between the skills and environmental action of students and teachers in fifth and sixth grade of public and private schools in ML? I hypothesized (H4) there is a significant relationship between the skills and environmental action of students and teachers in fifth and sixth grade of public and private schools in ML.

Specific Aims

To address these questions and hypotheses, I:

1. Defined the population of fifth and sixth grade students (cycle V of primary schools) of public and private schools in the ML.
2. Defined the population of teachers (V Cycle of primary schools) of public and private schools in ML.
3. Selected the sample under the previously determined inclusion and exclusion criteria.
4. Translated to Spanish the surveys to evaluate 5th and 6th grade students and their teachers.
5. Applied the survey to evaluate 5th and 6th grade students (one classroom per grade and school) and their teachers accordingly.

6. Analyzed the results of data collection using the SPSS statistical software.
7. Compared the relationship between the levels of environmental literacy between fifth and sixth grade students) and the results of their teachers using the chi-square test.

Chapter II

Methods

To determine the relationship between the environmental literacy of students and teachers of public and private schools of fifth and sixth grade in the ML area, I used a descriptive-correlational design based on primary data.

Through a structured questionnaire, the Peruvian Environmental Literacy Assessing tool (PELAT), adapted from the Middle School Environmental Literacy Instrument (MSELI) I surveyed 1396 students (645 in fifth grade and 751 in sixth grade) and 33 teachers (16 in fifth grade and 17 in sixth grade) from 18 schools (11 public and 7 private) to establish baseline information on the environmental literacy

In this chapter, I will outline the steps taken during the study by: 1) providing a statement of research ethics, 2) outlining the study assumptions and delimitations, 3) describing the PELAT for students and teachers separately, 4) describing the research setting and data collection, and 5) providing the procedure for obtaining consent, 6) showing the procedure to analyze the data.

Research Ethics

This study was conducted following all appropriate ethical procedures and regulations, including the Institutional Review Board (IRB) of Harvard University, that refers to all forms of investigation of human subjects involving minors.

School administrators received a letter of acceptance to give their written consent

to participate in the study (Auxiliary Appendix 1), and students received letters of consent (Auxiliary Appendix 2). Participating tutors received a parental permission form (Auxiliary Appendix 3), and teachers received a permission form.

Peruvian Environmental Literacy Assessing Tool (PELAT)

PELAT is an adaptation of the Instrument for Environmental Literacy Middle School (MSELI) used in the National Assessment Project Environmental Literacy (NELA) of the United States of America that takes place every year at the national level (McBeth et al., 2008). This environmental literacy assessment is a type of survey research. It is guided by two broad research questions that seeks to determine the following: (a) the level of environmental literacy of sixth and eighth-grade students across the United States on specific variables of environmental literacy (i.e., ecological knowledge, verbal commitment, real commitment, environmental sensitivity, general environmental feelings, environmental problems, and action skills); and (b) the general level of environmental literacy for sixth and eighth-grade students in the United States.

It is for these reasons that MSELI was used as a reference to be adapted to the Peruvian case, and it was called Peruvian Environmental Literacy Assessing Tool (PELAT) (see Appendices 1, 2 and 3).

For students and their fifth and sixth-grade teachers, PELAT was divided into five sections. Section I collected demographic and academic data. Section II qualitatively assessed the dimension of consciousness. Sections III, IV, and V evaluated knowledge, attitude, skills, and action, respectively. In all cases, these instruments were translated and adjusted to the Spanish language. It was found that the internal consistency of

PELAT was 0.8499 using Cronbach's alpha coefficient; commonly, alpha values between 0.80 and 0.90 are preferred, confirming its high reliability in the study.

PELAT for Students (5th and 6th grade)

For this study group, the general information section of PELAT consists of eight questions that were designed to capture relevant student demographics and curriculum data. Questions used in this section identified the eight independent variables of the study, which include: age, sex, residence and district of study, type of school, number of teachers, number of people working and living with the student.

Section I assessed the student's environmental awareness (A). This section used open-ended questions to assess the student's awareness of environmental problems. The response options were causes or effects. As a checklist, it has a value of 1 if the student answers and if not 0.

Section II was used to assess environmental knowledge (K). The section consisted of ten multiple-choice questions for the sixth grade and five multiple-choice questions for fifth grade, each with four response options related to Peruvian environmental knowledge, such as differentiation of the biodiversity of the coast, mountains, and the jungle. Each question contained only one correct answer, and to avoid guessing, one of the answer options was, "I do not know". To calculate the knowledge score, each correct answer received a numerical value of 1, and the incorrect answers were coded as 0.

Section III measured environmental attitude (A), and focused on sensitivity to various environmental problems. This section was composed of four and three questions for sixth and fifth-grade students, respectively. Likewise, four Likert questions were used

to assess the attitude of the students. The response options were on four-point scales in which the options vary from 1 to 4, where four is mostly, three is to a moderate extent, two is to a small extent, and one is by no means.

Section IV evaluated the environmental skills and actions of students (SA) concerning environmental problems since both are an expression of a competency and can be evaluated by the actions developed by the subjects of the research. Skills and actions go hand in hand with the skills and awareness profiles because these encourage the action and its potential. Besides, in this case, unlike the previous section, the action is linked to the consumption environment and the issue of contamination. This section is divided into two parts: (1) how do you profile yourself to act? Furthermore, (2) what do you do about strategy or personal action plan? For the fifth grade, the instrument had two questions about activities to save the planet and responsible consumption; and for the sixth-grade instrument, it had three questions: the same as the fifth-grade instrument and the persuasion question. The first part evaluated the students' abilities on a five-point scale in which the options ranged from 1 to 5, 5 being by a lot, 4 by almost everything, 3 by moderately, 2 by little, and 1 by nothing. The second part evaluated the students' actions through six Likert-style questions. The response options were on five-point scales in which the options vary from 1 to 5. Therefore, the maximum score of the action dimension was five points, and the minimum score was 1. The highest score refers to a more significant number of times he has done some activities in the last six months.

PELAT for Teachers (5th and 6th grade)

For V-cycle teachers (5th and 6th grades), this research used MSELI because this

survey provides a specific form for teachers. The instrument collected demographic data on participating teachers, as well as provided information on teachers' opinions about the environment and environmental education.

A pilot test was conducted with a small selected group of fifth and 6th-grade students and their teachers from a public and private elementary school to observe consistencies and refine the survey.

Research Setting and Participants

This study focused on people associated with grades 5 and 6 and their public and private elementary school teachers in Metropolitan Lima (ML) area, from May to June 2019. The fifth and sixth-grade students (11 to 12 years old) of both genders were from public and private schools with a total population of over 60 students. The teachers were those who introduced an environmental curriculum component into their discipline.

Sample Selection

The Regional Directorate of Metropolitan Lima, as part of the Peruvian Ministry of Education, groups public and private schools in seven Local Educational Management Units (called in Spanish as Unidad de Gestión Educativa Local (UGEL). Data were taken from the ESCALE website (Statistics on Educational Quality) that the Peruvian Ministry of Education uses as a tool to collect and automate all the information of all schools at the local and national level.

For both public and private schools, the selection of the districts of ML area (43 districts in total) was taken from the information provided by the National Institute of

Statistics and Informatics of Peru (INEI, 2016). This document has as primary sources the District Registry of Population and Housing – Sisfoh (2013) and the National Household Survey – Enaho (2012-2013). In addition, external sources such as the Educational Infrastructure Census (2013), the School Census (2013), the Student Evaluation Census (2012-2013), the National Registry of Municipalities (2014) and the National Census of Regional Governments (2014) were consulted. For this research, educational institutions, teachers, and students of fifth and sixth grade were from seven UGELs of Metropolitan Lima.

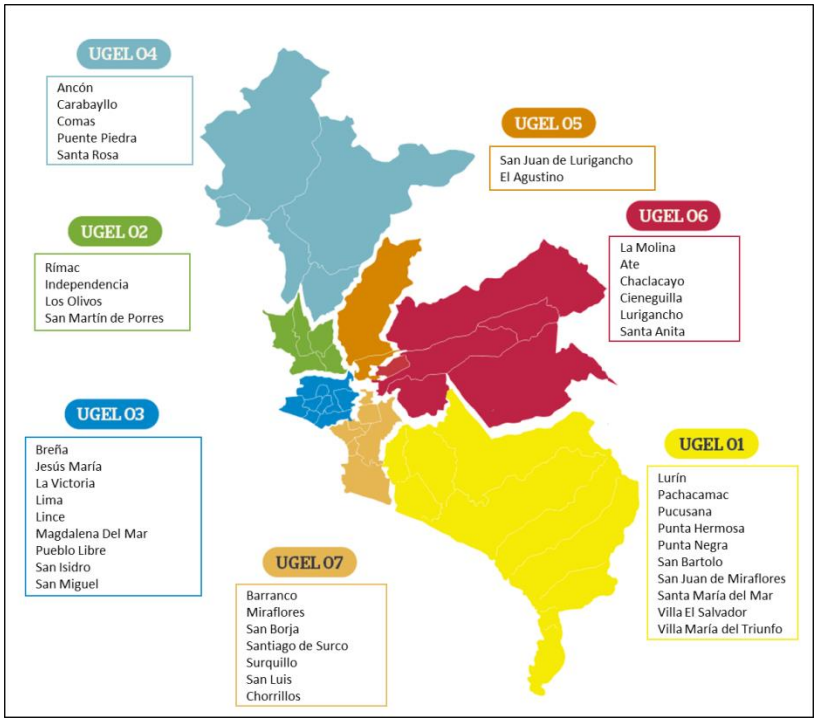

Figure 1. Location of the local educational management units of metropolitan Lima area.

Educational institutions, teachers, and students of fifth and 6th grade, corresponding to the seven UGELs of Metropolitan Lima (Figure 1), were considered.

Information on the quantity and location of public and private schools was obtained in the Educational Quality Statistics Database - ESCALE which provides information on this universe during 2018. This population included 8,839 teachers and 145,764 students in 5^{th} and 6^{th} grades.

I then identified a proportional sample of these students and teachers. The initial sample size was calculated using the formula for finite quantitative samples, using a 95% confidence level, a margin of error of 5%, the probability of occurrence of 0.5. The Peruvian Environmental Literacy Assessing tool – PELAT was used to survey 1396 students (645 in fifth grade and 751 in sixth grade) and 33 teachers (16 in fifth grade and 17 in sixth grade) from 18 schools (11 public and 7 private).

Survey Procedures

After selecting the sample, a group of interviewers, previously trained, was called to visit the schools, administer the evaluation instrument, and collect the demographic information related to the survey.

A pilot test was first conducted with 28 students in each of the fifth and sixth grades. Cronbach's alpha was 0.707 for the fifth-grade pilot, and 0.836 for the sixth-grade pilot; both are fair values to test the reliability of the instrument.

The survey was administered anonymously and securely to students and teachers (30 students and one teacher per classroom). Surveys were applied during school hours in May and June 2019. All 5th and 6th-grade students and teachers were instructed how to complete the survey.

Data Analysis

The students and teacher's information forms were entered into Excel spreadsheets and analyzed in several steps. First, information was analyzed by content analysis to generate frequency counts of pertinent data. Descriptive statistics were used to describe the levels of awareness, knowledge, attitude, skills, and action of both participant groups.

With the completed surveys, a database was developed using the SPSS Version 25 software. Based on this database, tables were developed to describe the responses of students and their teachers. Likewise, contingency tables were constructed that allowed the application of the chi-square test as the most appropriate for qualitative data examining associations between variable classes.

Chapter III

Results

This section details the results of the tests described in the Methods chapter, divided into sections that reflect the research questions considered. The first section focuses on student's data analysis (5th and 6th graders, and both together), organized by different EE dimensions. The second section similarly analyzes the data on teachers.

Students Data Analysis

The survey questionnaire was completed by 645 5th grade students and 751 6th grade students.

5th Grade Students

The majority (61.7%) of 5th grade students surveyed gave correct answers on the environmental awareness dimension (Table 2).

Table 2. 5th graders environmental awareness.

Type	Frequency	%	Acumulate %
Incorrect answers	247	38.3	38.3
Correct answers	398	61.7	100.0
Total	645	100.0	

Similarly, on the environmental knowledge dimension, most of the graders (62.5%) respond correctly (focused on the life cycle, basic biology, food chain, natural

resources, among others). The qualification corresponded to incorrect answers (which were rated zero) and correct answers that were rated 1 (Table 3).

Table 3. 5th graders environmental knowledge.

Type	Frequency	%	Acumulate %
Incorrect answers	242	37.5	37.5
Correct answers	403	62.5	100.0
Total	645	100.0	

More than the half of students surveyed (52.6%) on the environmental attitude dimension answered that they are moderate concerned about environmental problems, 25.4% responded greatly, 16.1% little and 5.9% not concerned (Table 4).

Table 4. 5th graders environmental attitude.

Types	Frequency	%	Acumulate %
No extent	38	5.9	5.9
A little extent	104	16.1	22.0
A moderate extent	339	52.6	74.6
A great extent	164	25.4	100.0
Total	645	100.0	

The majority (36.1%) answered that they perform almost all the activities to save the planet, 33.3% moderately, 11.6% much, 11.3% little, and 7.6% nothing on the environmental skills and action dimension (Table 5).

Table 5. 5th grade environmental skills and actions.

Type	Frequency	%	Acumulate %
Not at all	49	7.6	7.6
Little	73	11.3	18.9
Moderately	215	33.3	52.2
Almost all	233	36.1	88.4
Greatly	75	11.6	100.0
Total	645	100.0	

Finally, the majority (78.1%) of 5th grade students surveyed had medium environmental literacy, 18.1% had low literacy, and 3.7% high literacy (Table 6).

Table 6. 5th graders environmental literacy.

Types	Frequency	%	Acumulate %
Low	117	18.1	18.1
Medium	504	78.1	96.3
High	24	3.7	100.0
Total	645	100.0	

6th Grade Students

Approximately half of 6th grade students surveyed (55.5%) gave correct answers on the awareness dimension (Table 7).

Table 7. 6th graders environmental awareness.

Type	Frequency	%	Acumulate %
Incorrect answers	334	44.5	44.5
Correct answers	417	55.5	100.0
Total	751	100.0	

Most of these sixth graders (79.8%) gave correct answers on the knowledge dimension, so 20.2% answered incorrectly (Table 8).

Table 8. 6th graders environmental knowledge.

Type	Frequency	%	Acumulate %
Incorrect answers	152	20.2	20.2
Correct answers	599	79.8	100.0
Total	751	100.0	

The majority (49.7%) responded that they are regularly concerned about environmental problems, 31.8% were greatly concerned, 13.3% little and 5.2% not concerned on the environmental attitude dimension (Table 9).

Table 9. 6th graders environmental attitude.

Types	Frequency	%	Acumulate %
No extent	39	5.2	5.2
A little extent	100	13.3	18.5
A moderate extent	373	49.7	68.2
A great extent	239	31.8	100.0
Total	751	100.0	

The majority (32.9%), replied that they moderately carry out activities to save the planet, 30.4% almost all, 17.8% little, 14.1 % nothing, and 4.8% much (Table10).

Most 6th graders (73.5%) had a medium environmental literacy, 25.6% to a low literacy, and only 0.9% a high literacy (Table 11).

Table 10. 6th graders environmental skills and action.

Type	Frequency	%	Acumulate %
Not at all	106	14.1	14.1
Little	134	17.8	32.0
Moderately	247	32.9	64.8
Almost all	228	30.4	95.2
Greatly	36	4.8	100.0
Total	751	100.0	

Table 11. 6th graders environmental literacy.

Types	Frequency	%	Acumulate %
Low	192	25.6	25.6
Medium	552	73.5	99.1
High	7	0.9	100.0
Total	751	100.0	

5th and 6th Grade Students

Combined together, the majority (63.8%) of the student population gave correct answers on the environmental awareness dimension (Table 12).

Table 12. 5th and 6th graders environmental awareness.

Type	Frequency	%	Acumulate %
Incorrect answers	505	36.2	36.2
Correct answers	891	63.8	100.0
Total	1396	100.0	

Furthermore, these respondents gave correct answers (64.1% of the total) so that 35.9% were not successful on the environmental knowledge dimension (Table 13).

Table 13. 5th and 6th graders environmental knowledge.

Type	Frequency	%	Acumulate %
Incorrect answers	501	35.9	35.9
Correct answers	895	64.1	100.0
Total	1396	100.0	

The majority (52.4%) answered that they are moderate concerned about environmental problems and 26.4% greatly concerned (Table 14).

Table 14. 5th and 6th graders environmental attitude.

Types	Frequency	%	Acumulate
No extent	78	5.6	5.6
A little extent	218	15.6	21.2
A moderate extent	732	52.4	73.6
A great extent	368	26.4	100.0
Total	1396	100.0	

In addition, 35.7% of both populations replied that they perform almost all activities to save the planet, 33.5% moderately, 11.9% little, 11.2% greatly, and 7.7% that not at all (Table 15).

Table 15. 5th and 6th graders environmental skills and action.

Type	Frequenc	%	Acumulate %
Not at all	108	7.7	7.7
Little	166	11.9	19.6
Moderately	468	33.5	53.2
Almost all	498	35.7	88.8
Greatly	156	11.2	100.0
Total	1396	100.0	

By far, the highest number (78.6%) of both grades of students presented either a medium environmental literacy or high literacy (3.5%) (Table 16).

Table 16. 5th and 6th graders environmental literacy.

Types	Frequency	%	Acumulate %
Low	250	17.9	17.9
Medium	1097	78.6	96.5
High	49	3.5	100.0
Total	1396	100.0	

Teachers Data Analysis

The survey questionnaire was completed by 16 5th grade teachers and 17 6th grade students.

5th Grade Teachers

Firstly, the majority (75.0%) of the 16 5th grade teachers surveyed gave bad answers and only a quarter answered with the indifferent alternative on the environmental awareness dimension (Table 17).

Table 17. 5th grade teacher's environmental awareness.

Type	Frequency	%	Acumulate %
Bad	12	75.0	75.0
Indiferent	4	25.0	100.0
Total	16	100.0	

Secondly, most of these teachers (68.8%) disagreed with the answers but the

quarter sample agreed (31.3%) on the knowledge dimension (Table 18).

Table 18. 5th grade teacher´s environmental knowledge.

Type	Frequency	%	Acumulate %
Agree	5	31.3	31.3
Disagree	11	68.8	100.0
Total	16	100.0	

More than the half of teachers surveyed (62.5%) answered that they frequently participate in environmental experiences, and 18.8% almost always (Table 19).

Table 19. 5th grade teacher´s environmental attitude.

Type	Frequency	%	Acumulate %
Sometimes	2	12.5	12.5
Frequently	10	62.5	75.0
Almost	3	18.8	93.8
Always	1	6.3	100.0
Total	16	100.0	

The majority (68.8%) answered that the actions the teachers have taken were highly effective, and 31.3% were responded they were effective (Table 20).

Table 20. 5th grade teacher´s environmental skills and action.

Type	Frequency	%	Acumulate %
Efective	11	68.75	68.75
Highly Efective	5	31.25	100
Total	16	100	

Finally, most (88.3%) 5th grade teachers surveyed had a high environmental literacy with 18.8% of medium environmental literacy (Table 21).

Table 21. 5th grade teacher´s environmental literacy

Types	Frequency	%	Acumulate %
Medium	3	18.8	18.8
High	13	81.3	100.0
Total	16	100.0	

6th Grade Teachers

The majority (82.4%) of 6th grade teachers surveyed on the awareness dimension felt bad about Peru's environmental problems, with o17.6% indifferent (Table 22).

Table 22. 6th grade teacher´s environmental awareness.

Type	Frequency	%	Acumulate %
Bad	14	82.4	82.4
Indifferent	3	17.6	100.0
Total	17	100.0	

Most of these teachers surveyed (76.5%) agreed on the environmental knowledge dimension questions, and 23.5% disagreed (Table 23).

Table 23. 6th grade teacher´s environmental knowledge.

Types	Frequency	%	Acumulate %
Disagree	4	23.5	23.5
Agree	13	76.5	100.0
Total	17	100.0	

The majority (35.3%) of these teachers surveyed on the attitude dimension responded that frequently or almost always they have participated in environmental experiences, 11.8% always and never, and 5.9% sometimes (Table 24).

Table 24. 6th grade teacher´s environmental attitude.

Types	Frequency	%	Acumulate %
Never	2	11.8	11.8
Sometimes	1	5.9	17.6
Frequently	6	35.3	52.9
Almost	6	35.3	88.2
Always	2	11.8	100.0
Total	17	100.0	

Of the 6th grade teachers surveyed, 58.8% responded that the environmental skills and actions taken were highly effective, and 29.4% were effective (Table 25).

Table 25. 6th grade teacher´s environmental skills and action.

Types	Frequency	%	Acumulate %
Less Effective	2	11.8	11.8
Effective	5	29.4	41.2
Highly effective	10	58.8	100.0
Total	17	100.0	

In conclusion, the majority of the 17 primary 6th grade teachers surveyed (76.5%) corresponded to a high level of environmental literacy, and 23.5% to a medium level of environmental literacy (Table 26).

Table 26. 6th grade teacher´s environmental literacy.

Types	Frequency	%	Acumulate %
Medium	4	23.5	23.5
High	13	76.5	100.0
Total	17	100.0	

5th and 6th Grade Teachers

The majority of the 33 public and private school teachers surveyed (78.8%) on the awareness dimension said they felt bad about Peru's environmental problems, and 21.2% felt indifferent (Table 27).

Table 27. 5th and 6th grader teacher´s environmental awareness.

Type	Frequency	%	Acumulate %
Bad	26	78.8	78.8
Indifferent	7	21.2	100.0
Total	33	100.0	

The majority (72.7%) of the 33 teachers surveyed on the knowledge dimension agreed with the alternatives and 27.3% disagreed (Table 28).

Table 28. 5th and 6th grade teacher´s environmental knowledge.

Type	Frequency	%	Acumulate %
Disagree	9	27.3	27.3
Agree	24	72.7	100.0
Total	33	100.0	

Thirdly, the majority (48.5%) of these teachers surveyed on the attitude

dimension responded that they have frequently participated in environmental experiences, and 27.3% almost always, but only 6.1% never (Table 29).

Table 29. 5th and 6th grade teacher´s environmental attitude.

Type	Frequency	%	Acumulate %
Never	2	6.1	6.1
Sometimes	3	9.1	15.2
Frequently	16	48.5	63.6
Almost	9	27.3	90.9
Always	3	9.1	100.0
Total	33	100.0	

The majority (48.5%) of the teachers surveyed on environmental skills and actions agreed that actions taken were effective, and 45.5% highly effective (Table 30).

Table 30. 5th and 6th grade teacher´s environmental skills and action

Type	Frequency	%	Acumulate %
Less effective	2	6.1	6.1
Effective	16	48.5	54.5
Highly effective	15	45.5	100.0
Total	33	100.0	

Finally, most of 5th and 6th grade teachers (78.8%) corresponded to a high level of environmental literacy, and 21.2% to a medium level (Table 31).

Table 31. 5th and 6th grade teacher´s environmental literacy.

Type	Frequency	%	Acumulate %
Medium	7	21.2	21.2
High	26	78.8	100.0
Total	33	100.0	

Hypotheses Tests

Test of Hypothesis 1

The research hypothesis to be tested was that there is a significant relationship between the environmental awareness of students and teachers in fifth and sixth grades of public and private schools in ML.

I disaggregated this test into three statistical hypotheses: one proves the relationship between students' environmental awareness and 5th grade teachers; other tests the relationship between students' environmental awareness and sixth-grade teachers, and another tests the relationship between students' environmental awareness and fifth and sixth-grade teachers in aggregate.

Firstly, the asymptotic (bilateral) significance ($p<0.0001$) result of the chi-square shows there is a significant relationship between the environmental awareness of students and their teachers in the 5th grade (Table 32).

Table 32. Chi square test between 5th graders and their teacher´s environmental awareness dimension.

	Value	df	Asymptotic significance (bilateral)
Pearson's Chi-square	111,108	1	0.000
Continuity correction	109.361	1	0.000
Likelihood ratio	121.421	1	0.000
Linear association by linear	110.936	1	0.000
N of valid cases	645		

Similarly, the environmental awareness of 6th-grade students and their teachers was significantly related ($p<0.0001$) (Table 33).

Table 33. Chi square test between 6th graders and their teacher´s environmental awareness.

	Value	df	Asymptotic significance (bilateral)
Pearson's Chi-square	254,267	1	0.000
Continuity correction	251.888	1	0.000
Likelihood ratio	283.745	1	0.000
Linear association by linear	253.929	1	0.000
N of valid cases	751		

Finally, of course there is also then a significant relationship between the environmental awareness of the combined students in 5th and 6th grade and their teachers ($p<0.0001$) (Table 34).

Table 34. Chi square test between 5th and 6th graders and their teacher´s environmental awareness.

	Value	df	Asymptotic significance (bilateral)
Pearson's Chi-square	182,399[a]	1	0.000
Continuity correction	180.832	1	0.000
Likelihood ratio	200.508	1	0.000
Linear association by linear	182.269	1	0.000
N of valid cases	1396		

Test of Hypothesis 2

This research hypothesis was that there is a significant relationship between the environmental knowledge of students and teachers in the fifth and sixth grades of public and private schools in ML. Similar to hypothesis 1, I disaggregated this test into three statistical hypotheses related with environmental knowledge dimension.

Environmental knowledge was significantly correlated between of the students in the 5th grade of primary school and their teachers (chi-square test, ($p<0.0001$) (Table 35).

Table 35. Chi square test between 5th graders and their teacher´s environmental knowledge.

	Value	df	Asymptotic significance (bilateral)
Pearson's Chi-square	80,685	2	0.000
Likelihood ratio	93.888	2	0.000
Linear association by linear	48.173	1	0.000
N of valid cases	645		

Similarly, there was a significant relationship between the environmental knowledge of 6th-grade students and their teachers ($p<0.0001$) (Table 36).

Table 36. Chi square test between 6th graders and their teacher´s environmental knowledge.

	Value	df	Asymptotic significance (bilateral)
Pearson's Chi-square	141,555	3	0.000
Likelihood ratio	124.862	3	0.000
Linear association by linear	89.928	1	0.000
N of valid cases	751		

Finally, there was a significant relationship between the environmental knowledge of 6th-grade primary school students and that of their teachers ($p<0.0001$) (Table 37).

Table 37. Chi square test between 5th and 6th graders and their teacher´s environmental knowledge.

	Value	df	Asymptotic significance (bilateral)
Pearson's Chi-square	168,352	2	0.000
Likelihood ratio	191.747	2	0.000
Linear association by linear	76.449	1	0.000
N of valid cases	1396		

Test of Hypothesis 3

The research hypothesis was that there is a significant relationship between the environmental attitude of students and teachers in the fifth and sixth grades of public and private schools in ML.

There were significant relationships for environmental attitude between the students in the 5th grade of primary school and that of their teachers (chi-square test, $p<0.0001$) (Table 38), for 6th grade students and their teachers (Table 39) and for the combined classes of students and their teachers (Table 40).

Table 38. Chi square test between 5th graders and their teacher´s environmental attitude.

	Value	df	Asymptotic significance (bilateral)
Pearson's Chi-square	913,185	9	0.000
Likelihood ratio	831.980	9	0.000
Linear association by linear	280.196	1	0.000
N of valid cases	645		

Table 39. Chi square test between 6th graders and their teacher´s environmental attitude.

	Value	df	Asymptotic significance (bilateral)
Pearson's Chi-square	623,953	12	0.000
Likelihood ratio	337.667	12	0.000
Linear association by linear	184.922	1	0.000
N of valid cases	751		

Table 40. Chi square test between 5th and 6th graders and their teacher´s environmental attitude.

	Value	df	Asymptotic significance (bilateral)
Pearson's Chi-square	1,759,893	9	0.000
Likelihood ratio	1563.761	9	0.000
Linear association by linear	493.984	1	0.000
N of valid cases	1396		

Test of Hypothesis 4

The research hypothesis tested was that there is a significant relationship between the skills and environmental actions of students and teachers in the fifth and sixth grades of private and public schools in ML.

As with the first three hypotheses, there were significant relationships between the skills and environmental action of students for the 5th grade students and that of their teachers (chi-square test, $p<0.0001$) (Table 41), for the 6th grade students and that of their teachers ($p<0.0001$) (Table 42), and for the combined classes of students and their teachers ($p<0.0001$) (Table 43).

Table 41. Chi square test between 5th graders and their teacher´s environmental skills and action.

	Value	df	Asymptotic significance (bilateral)
Pearson's Chi-square	245,505	8	0.000
Likelihood ratio	234.955	8	0.000
Linear association by linear	162.736	1	0.000
N of valid cases	645		

Table 42. Chi square test between 6th graders and their teacher´s environmental skills and action.

	Value	df	Asymptotic significance (bilateral)
Pearson's Chi-square	252,970	12	0.000
Likelihood ratio	256.551	12	0.000
Linear association by linear	123.903	1	0.000
N of valid cases	751		

Table 43. Chi square test between 5th and 6th graders and their teacher´s environmental skills and action.

	Value	df	Asymptotic significance (bilateral)
Pearson's Chi-square	479,887	8	0.000
Likelihood ratio	461.137	8	0.000
Linear association by linear	328.523	1	0.000
N of valid cases	1396		

General Hypothesis Test

The research hypothesis to be tested was that there is a significant relationship between students' environmental literacy and the fifth and sixth-grade teachers of public and private schools in ML.

The results showed significant relationships between environmental literacy of students for the 5th grade students and that of their teachers (chi-square test, $p<0.0001$) (Table 44), for the 6th grade students and that of their teachers ($p<0.0001$) (Table 45), and for the combined classes of students and their teachers ($p<0.0001$) (Table 46).

Table 44. Chi square test between 5th graders and their teacher´s environmental literacy.

	Value	df	Asymptotic significance (bilateral)
Pearson's Chi-square	159,432	4	0.000
Likelihood ratio	100.413	4	0.000
Linear association by linear	95.032	1	0.000
N of valid cases	645		

Table 45. Chi square test between 6th graders and their teacher´s environmental literacy.

	Value	df	Asymptotic significance (bilateral)
Pearson's Chi-square	66,345	4	0.000
Likelihood ratio	66.821	4	0.000
Linear association by linear	63.581	1	0.000
N of valid cases	751		

Table 46. Chi square test between 5th and 6th graders and their teacher´s environmental literacy.

	Valor	df	Significación asintótica (bilateral)
Pearson's Chi-square	273,228	4	0.000
Likelihood ratio	158.935	4	0.000
Linear association by linear	140.445	1	0.000
N of valid cases	1396		

Chapter IV

Discussion

The purpose of this study was to determine the relationship between the environmental literacy of students and teachers of fifth and sixth grades of public and private schools in the Metropolitan Lima (ML) area. Hypotheses of this study were fully confirmed by revealing that were significant relationships between environmental literacy and all its components with students in grades 5th and 6th and their teachers

This chapter discusses the conclusions and their implications, recommends activities to teachers and their students to improve their environmental profiles, and finally, suggest options for expanding research.

Conclusions

Results of each of the four specific research objectives are described below:

Specific Objective 1

I sought to determine the relationship between the environmental awareness, knowledge, and attitudes of students and teachers of the fifth and sixth grades of public and private schools in Metropolitan Lima area. For the environmental awareness dimension, 63.8% of the students, in general, had a high environmental awareness. Specifically, in public schools, many students in fifth grade (68%) had a high level of awareness compared to sixth-grade students (49%) who had a low level of consciousness.

In private schools, the scenario was similar, with 72% of fifth-grade students having a high level of awareness, while 47% of sixth-grade students were low. So, it can be concluded that fifth-grade students, from both public and private schools, have high environmental awareness, while sixth-grade students have low environmental awareness.

In the case of teachers, environmental awareness was 78.8%. This demonstrates what Unesco (1977) pointed out, that the main objective of environmental educators is to develop in students knowledge, skills, attitudes, motivation and awareness to work on environmental problems (for example: drinking water quality, chemical products use, Amazon deforestation, garbage accumulation, native animals and plants extinction, sound pollution and excessive plastic use) and their prevention. Gonzales- Gaudiano and Lorenzetti (2009) point out that in Colombia, the emphasis has been placed on school environmental projects, called PRAES, to strengthen the dimensions mentioned above in teachers and students.

In inferential terms, the results reported here indicated a significant relationship between the environmental awareness of students and teachers of the fifth and sixth grade of public and private schools in Metropolitan Lima area. Additionally, there is a significant negative relationship between the environmental awareness component of teachers and the ability of students ($r = - .081$, $p < .01$), which means that there is an inversely proportional relationship between teacher awareness and student ability.

However, Neveg et al. (2008) demonstrated that in Israel, 6th and 12th-grade students do not have a significant relationship between knowledge and behavior, since there was only a moderate relationship between the attitudes and behavior of those students.

Finally, for Elder (2003), as mentioned in the Tbilisi Declaration, environmental awareness is essential to help social groups and people gain awareness and sensitivity towards their environment and related problems, which is inferred in this study.

For the environmental knowledge dimension, 64.1% of students had high environmental knowledge. Specifically, in public schools, most fifth-grade students (69%) and sixth-grade students (49%) had a high level of awareness. In private schools, the scenario was different, with 49% of fifth-grade students having a high level of awareness, while 51% of sixth-grade students were low. So, it can be concluded that fifth-grade students, from public and private schools, have high environmental knowledge, while sixth-grade private school students have in-depth environmental knowledge.

Alp et.al. (2006) showed that older students (in this study refers to students in 10th grade) have significantly higher levels of environmental knowledge than those in 6th grade.

In the case of teachers, environmental knowledge was 72.7%. For Elder (2003), as mentioned in the Tbilisi Declaration, environmental knowledge is essential to help social groups and people acquire a variety of experiences and acquire a basic understanding of the environment and related problems, which is demonstrated in inferential terms in this study.

Finally, there was a significant relationship between the environmental knowledge of students and teachers of the fifth and sixth grade of public and private schools in Metropolitan Lima. Additionally, there is a significant positive relationship between the environmental knowledge component of teachers and that of students ($r = .101$, $p < .01$),

which means that there is a directly proportional relationship between the knowledge of teachers and students.

Karpudewan et. al. (2015) demonstrated that the relationship between the attitude and knowledge of 11-year-old students in Malaysia was not significant since environmental knowledge focused on understanding students' and teachers' problems related to global warming only.

For environmental attitude dimension, 52.4% of students had a regular environmental attitude. Specifically, in public schools, most fifth-grade students (69%) and sixth-grade students (49%) had a high level of attitude. In private schools, the scenario was different since 57% of fifth-grade students had a high level of attitude, while 51% of sixth-grade students had low levels. Fifth graders from public and private schools have positive environmental attitudes, while sixth graders of private schools pose a low environmental attitude.

Alp et. al. (2006), showed that older students (in this study refers to students in 10th grade) have significantly lower levels of environmental knowledge than those in 6th grade. This was corroborated by Eagles and Demare (1999) who found that Canadian 6th-grade students showed environmentalist and moralistic attitudes towards the environment, which are correlated with talking about the environment in all their scenarios of life, without having a specific program related to the EE.

In the case of teachers, 48.5% participated in many environmental experiences. For Elder (2003), as mentioned in the Tbilisi Declaration, an environmental attitude is essential to help social groups and people to acquire a set of values and feelings of concern about the environment and a powerful motivation to participate in its

improvement and protection.

This can be inferred from this study. There was a significant relationship between the environmental attitude of students and teachers of the fifth and sixth grade of public and private schools in Metropolitan Lima area. Additionally, there was no significant relationship between the environmental attitude of teachers and students.

For Alp et. al. (2006), the knowledge and attitude of Turkish students between 6th and 10th grade varied with gender and age, such that women had more favorable behavioral intentions, and older students had more positive attitudes towards the environment.

Specific Objective 2

I sought to determine the relationship between the skills and environmental actions of students and teachers in the fifth and sixth grades of public and private schools in ML area. The results showed that 35.7% of students were engaged and perform almost all actions to save the planet. Specifically, most fifth grade students in public and private schools have high environmental skills and actions (53% and 56%, respectively). Most sixth graders of schools public and private had a lower level concerning their skills and environmental actions (86% and 56% respectively). Therefore, fifth graders from public and private schools had a high level of environmental skills and actions, while sixth graders of both types of schools had a low level.

In the case of teachers, 48.5% considered that the actions taken to save the planet were effective. For Elder (2003), as mentioned in the Tbilisi Declaration, environmental skills and actions are essential to help social groups and people acquire skills to identify

and solve problems about the environment and an opportunity to participate actively. At all levels of work towards the resolution and/or prevention of these types of problems, which is demonstrated in inferential terms in this study.

In this study, there was a significant relationship between the skills and environmental action of students and teachers of the fifth and sixth grade of public and private schools in Metropolitan Lima area. Additionally, there was a significant, although weak negative relationships between the teachers' environmental action component and awareness ($r = - 0.159$, $p < .01$), ability ($r = - .121$, $p < .01$), and action ($r = - .122$, $p < .01$) of the students.

General Objective

The overall aim was to determine the relationship between the environmental literacy of students and teachers of the fifth and sixth grades of public and private schools in ML area. The results showed that 78.6% of students had a medium level of environmental literacy. Overall, their environmental attitude was not significantly related to skills, action, awareness, and environmental knowledge ($F = 0.646$, $p > .05$).

The components of environmental literacy (awareness, knowledge, action, and skills) were higher for 5th-grade compared to 6th-grade students. Likewise, the most significant difference between students was in the environmental skills component since 5th-grade students had a higher level of environmental ability. The environmental knowledge component is most developed for students in both grades of public and private schools.

In the case of teachers, 78.8% had a high level of environmental literacy. For fifth

and 6th grade teachers who work in public and private schools in the Lima metropolitan area, environmental ability had no statistical significance in comparison to awareness, action, attitude, and environmental knowledge ($F = 0.991$, $p > .05$).

Teachers working in public schools had a higher level of environmental literacy components (environmental awareness, knowledge, and attitude) when compared to teachers working in private schools. However, teachers who work in private schools have a higher level of environmental action than those who work in public schools. Likewise, the component that predominates in teachers of both grades without distinction of labor institution is that of environmental attitude.

Overall, the results demonstrated a significant relationship between the environmental literacy of students and teachers of the fifth and sixth grade of public and private schools in Metropolitan Lima area.

In conclusion, all of the above results are consistent with those expected by the ages of the students in the sample: according to Piaget (1972), 11 and 12 years olds acquire knowledge and develop attitudes about ecological issues from kindergarten, and these new attitudes and knowledge shape the later thinking of adolescents and adults.

Implications and Recommendations

The environmental plan for schools should act as a living document to provide updated resources and tools available for everyone to support the implementation of environmental education properly. Likewise, the plan should include a means to evaluate programs and establish reference standards.

The environmental education (EE) component promoted should be added into the

curriculum standards required for all public and private schools in Lima at all grade levels based on activities related with all the SDGs. A statewide requirement is necessary because a low level of environmental education inherently results in a low level of public understanding and support for environmental policies. This requirement will serve to increase student knowledge and general environmental literacy significantly, and will enable students to become informed citizens capable of making informed decisions about environmental concerns. It should ensure that students have experience in biological, physical, and social sciences, and have outdoor classroom experiences to provide them with opportunities to participate in projects and research. Finally, these EE requirements should endeavor to develop environmental managers.

Bearing in mind that the level of environmental literacy of Peruvian students and teachers, according to the AKASA model, has shown that it is of medium level, it is recommended to analyze how to improve understanding of the evaluation questions, and how to improve these standards at the pedagogical and environmental levels.

In addition, each school should have a science lab. Ideally, the environmental program would include offering courses dedicated exclusively to the study of environmental sciences, offering student programs that improve environmental literacy, including a formal recycling program, an environmental club, and/or a gardening club.

Finally, it is recommended that each school offer training for all teachers on the environmental education curriculum. The training should include experience in the use of facilities and materials for the teacher to acquire skills with various teaching tools and methods. Training should be provided locally as part of the development time of teaching staff. Sensitivity training and the perception of relevance should be taken into account

during teacher training programs; therefore, a local teacher who has succeeded in integrating environmental education in their classroom, or a teacher who is excited about the anticipated environmental program, will be more successful during training than an external consultant. This should provide a framework to address pedagogies to teach environmental dilemmas in an interdisciplinary classroom.

Future Research

The methodological tool, PELAT, is made available to those who want to quantitatively assess environmental literacy levels, under the AKASA model, to create pedagogical strategies that help to face environmental problems, that is, to raise environmental literacy, in regular feedback processes.

This study showed that the environmental literacy of students and their fifth and sixth-grade teachers are significantly related. Future research efforts should further separate student curricular options. For example, it would be interesting to study whether there are correlations between science courses and environmental literacy.

It is suggested that MINEDU and MINAM disseminate the importance of AKASA and its establishment in pilot programs with a duration of three years, to be applicable and developed in the future in schools according to the results obtained. For instance, in Peru some model schools where environmental activities are well applied in their courses and activities could be selected.

The public and private schools throughout Peru should be censused with established diagnostics to evaluate the real situation of their students and teachers in all grade levels. This should include interviews with the participating principals, teachers,

and students involved.

Comprehensive assessments of environmental literacy are needed throughout Peru to improve the understanding and status of environmental literacy. Authorities and researchers can start with a benchmarking of schools with environmental programs in rural and urban areas. These interdisciplinary environmental efforts can provide additional data to disseminate the lack of environmental literacy founded in this research by the AKASA model, as applied in the United States many years ago.

Appendix 1

5th Grade Students' Questionnaire

Dear student:

We are doing research to determine the levels of environmental literacy in fifth grade students of public and private schools in Metropolitan Lima. We ask you to support us with this cause, completing this questionnaire as honestly as possible.

We remind you that this questionnaire is anonymous and confidential. Please do not write your name. All the information you provide will be strictly confidential, no one will know what you answered. Although the educational institution is collaborating with the study, they will not have access to any of these questionnaires. Please, feel confident to respond freely and without fear of being criticized or sanctioned. Thank you in advance for your cooperation.

Instructions

1. Do not write your first or last name.
2. Answer all questions as honestly as possible.
3. If you have any questions, please raise your hand, and ask the pollster in private.

General Information
Age: ___ years. Gender: ( ) Male ( ) Female District / urbanization in which you live: _____ Type of educational institution: Public ( ) Private ( ) Religious ( ) N° teachers that teach you: _____ District / urbanization which you study: _____ How many people live in your home? _____ How many people work in your home? _____
I. Environmental Awareness (A)
Place the possible consequences or effects that you consider to be familiar and important in your life and in your environment. For example: Cause: Environmental pollution Effect: Low water quality 1. Cause: Air contamination Consequence: _____ 2. Cause: Auditory contamination Consequence: _____ 3. Cause: Garbage excess Consequence: : _____
II. Environmental knowledge (K)
In the following questions, mark with a circle () the options that most reflect your knowledge on the subject. Remember that nobody will know your answers, it is secret. 4. A flower with colored petals and a sweet aroma would be more likely to be pollinated by: a. rain b. wind c. gardener d. insects 5. A small bird eats a butterfly that has been eating the nectar of a flower. Then the bird is eaten by a hawk. This is an example of: a. cooperation b. food chain c. competence d. survival 6. The original source of energy for almost all living things is: a. The sun b. water c. The soil d. plants 7. Most of the oxygen in the atmosphere comes from: a. Insects b. Plants c. The soil d. The sun 8. The extinction of species over time is a phenomenon that happens naturally. However, the human population carries out activities that have caused the accelerated extinction of many species, such as, for example: a. illegal minery b. Deforestation c. Climate change d. All of them
III. Environmental attitude (A)

In the following questions, mark with an "X" the most appropriate alternative for you that reflects your knowledge on the subject. Remember that nobody will know your answers, it is secret.

9.	To what extent your family and you TAKE CARE of the natural environment?	No extent	A little extent	A moderate extent	A great extent
10.	To what extent are you and your family CONCERNED about environmental issues?	No extent	A little extent	A moderate extent	A great extent
11.	To what extent do you watch programs / videos / documentaries about environmental issues?	No extent	A little extent	A moderate extent	A great extent

IV. Skills and action (S-A)

Each of the following items reviews different aspects of you and the environment. Please be completely honest. There are no correct or incorrect answers. Mark off with an "X" the most appropriate alternative for you.

Activities to save the planet. For example: a) recycling glass and / or plastic, b) building or placing boxes of nests for birds, and c) cleaning garbage areas.

12	How knowledgeable do think you are about the activities to save the planet?	Not at all	Little	Moderately	Almost all	Greatly	
13	Circle the number of times have you done each of the following activities to save the planet over the last six months	Number of times					
	a) Use alternative forms of transportation. For example: walking, bicycle riding, shared mobility, public transport.	0	1	2	3	4	+5
	b) Taking measures to reduce the energy used for ironing, air conditioning, and / or lighting.	0	1	2	3	4	+5
	c) Others: _____	0	1	2	3	4	+5

Responsible consumption. For example: a) Stop buying excessively packaged products, b) reject the purchase of products with preservatives.

14	How knowledgeable do think you are about responsible consumption?	Not at all	Little	Moderately	Almost all	Greatly	
15	Circle the number of times have you done each of the following activities to save the planet over the last six months	Number of times					
	a) Buy products packaged in reusable, returnable or recyclable packaging.	0	1	2	3	4	+5
	b) Avoid using plastic bags in stores, supermarkets, and other supply centers.	0	1	2	3	4	+5
	c) Others:_____	0	1	2	3	4	+5

Thank you very much for your collaboration and honest information. Your contributions will be very important to improve the environmental education of the students of your country.

Appendix 2

6th Grade Students' Questionnaire

Dear student:

We are doing research to determine the levels of environmental literacy in sixth grade students of public and private schools in Metropolitan Lima. We ask you to support us with this cause, completing this questionnaire as honestly as possible.

We remind you that this questionnaire is anonymous and confidential. Please do not write your name. All the information you provide will be strictly confidential, no one will know what you answered. Although the educational institution is collaborating with the study, they will not have access to any of these questionnaires. Please, feel confident to respond freely and without fear of being criticized or sanctioned. Thank you in advance for your cooperation.

Instructions

1. Do not write your first or last name.
2. Answer all questions as honestly as possible.
3. If you have any questions, please raise your hand and ask the pollster in private.

General Information

Age: ___ years. Gender: ( ) Male ( ) Female District / urbanization in which you live: _____
Type of educational institution: Public ( ) Private ( ) Religious ( ) N° teachers that teach you: _____
District / urbanization which you study: _____
How many people live in your home? _____ How many people work in your home? _____

I. Environmental Awareness (A)

Place the possible causes and / or consequences or effects that you consider to be familiar and important in your life and in your environment. For example: Cause: Environmental pollution Effect: Low water quality

1. Cause: Air pollution Effect: _____
2. Cause: Pollution caused by excessive sound Effect: _____
3. Cause: _____ Effect: Excess of streets garbage
4. Cause: _____ Effect: Species in danger of extinction
5. Cause: Poor environmental education Effect: _____

II. Environmental knowledge (K)

In the following questions, mark with a circle ( ) the options that most reflect your knowledge on the subject. Remember that nobody will know your answers, it is secret.

6. A flower with colored petals and a sweet aroma would be more likely to be pollinated by:
   a. rain b. wind c. gardener d. insects
7. A small bird eats a butterfly that has been eating the nectar of a flower. Then the bird is eaten by a hawk. This is an example of:
   a. cooperation b. food chain c. competence d. survival
8. Which of the following alternatives is a predator-prey relationship?
   a. The flea bites the dog
   b. The hawk eats the chicken
   c. The caterpillar eats the leaf
   d. A deer eats grass with a grasshooper in it.
9. A cat and a snake are hunting the same mouse, what is the relationship between the cat and the snake?
   a. One is using the other, but not harming it
   b. They are competing
   c. They are helping each other
   d. One is trying to eat the other.

10. The original source of energy for almost all living things is:
    a. The sun b. water c. The soil d. plants
11. Most of the oxygen in the atmosphere comes from:
    a. Insects b. Plants c. The soil d. The sun
12. Which of the following is part of the water cycle?
    a. Erosion b. Waves c. Evaporation d. Decomposition
13. What do a bear, a cow and a whale have in common? The three are:
    a. Invertebrates b. Amphibians c. Reptiles d. Mammals
14. Oil is a complex chemical compound, which contains solid, liquid and gaseous substances. This compound is also called:
    a. Hydrocarbon c. The options a and
    b. Fossil fuel b None of the above

15. The extinction of species over time is a phenomenon that happens naturally. However, the human population carries out activities that have caused the accelerated extinction of many species, such as, for example:
    a. Illegal minery c. Climate change
    b. Deforestation d. All the above

III. Environmental attitude (A)

In the following questions, mark with an "X" the most appropriate alternative for you that reflects your knowledge on the subject. Remember that nobody will know your answers, it is secret.

16	To what extent your family and you TAKE CARE of the natural environment?	No extent	A little extent	A moderate extent	A great extent
17	To what extent are you and your family CONCERNED about environmental issues?	No extent	A little extent	A moderate extent	A great extent
18	To what extent do you watch programs / videos / documentaries about environmental issues?	No extent	A little extent	A moderate extent	A great extent
19	To what extent the programs / videos / documentaries about environmental problems make an impression?	No extent	A little extent	A moderate extent	A great extent

IV. Skills and action (S-A)

Each of the following items reviews different aspects of you and the environment. Please be completely honest. There are no correct or incorrect answers. Mark off with an "X" the most appropriate alternative for you.

Activities to save the planet. For example: a) recycling glass and / or plastic, b) building or placing boxes of nests for birds, and c) cleaning garbage areas.

20	How knowledgeable do think you are about the activities to save the planet?	Not at all	Little	Moderately	Almost all	Greatly
21	How skilled do you think you have to carry out activities to save the planet?	Not at all	Little	Moderately	Almost all	Greatly
22	Circle the number of times have you done each of the following activities to save the planet over the last six months	Number of times				
	a) Use alternative forms of transportation. For example: walking, bicycle riding, shared mobility, public transport.	0	1	2	3	4	+5
	b) Taking measures to reduce the energy used for ironing, air conditioning, and / or lighting.	0	1	2	3	4	+5

	c) Taking measures to reduce water consumption.	0	1	2	3	4	+5
	d) Recycling things such as paper, glass, plastic, metal or organic material.	0	1	2	3	4	+5
	e) Others: _____	0	1	2	3	4	+5

Responsible consumption. For example: a) Stop buying excessively packaged products, b) reject the purchase of products with preservatives.

23	How knowledgeable do think you are about responsible consumption?	Not at all	Little	Moderately	Almost all	Greatly
24	How skilled do you think you have to apply responsible consumption?	Not at all	Little	Moderately	Almost all	Greatly

25	Circle the number of times have you done each of the following activities to save the planet over the last six months	Number of times					
	a) Buy products packaged in reusable, returnable or recyclable packaging.	0	1	2	3	4	+5
	b) Avoid using plastic bags in stores, supermarkets, and other supply centers.	0	1	2	3	4	+5
	c) Stop buying products whose growth was based on toxic or dangerous pesticides.	0	1	2	3	4	+5
	d) Try to buy products packed in glass and not in plastic.	0	1	2	3	4	+5
	a) Others: _____	0	1	2	3	4	+5

Persuasion. For example: a) convince your family to start saving energy by turning off unused lights, b) convince a friend to steal your pet, or c) convince your mom to separate the trash.

26	How knowledgeable do think you are about persuasion?	Not at all	Little	Moderately	Almost all	Greatly
27	How skilled do you think you are in your ability to use persuasion?	Not at all	Little	Moderately	Almost all	Greatly

28	Circle the number of times have you done each of the following activities to save the planet over the last six months	Number of times					
	a) Talked to someone and encourage him/her to support a positive environmental action.	0	1	2	3	4	+5
	b) Distributed literature supporting a "pro" environmental position or action,	0	1	2	3	4	+5
	c) Encourage an individual or a group involved in destructive environmental behavior to stop that activity.	0	1	2	3	4	+5
	d) Signed or distributed a petition encouraging a person, group or community to take action aimed at improving the environment.	0	1	2	3	4	+5
	e) Others: _____	0	1	2	3	4	+5

Thank you very much for your collaboration and honest information. Your contributions will be very important to improve the environmental education of the students of your country.

Appendix 3

Teachers Questionnaire

Dear teacher:

We are doing research to determine the levels of environmental literacy in fifth and sixth grade students and teachers of public and private schools in Metropolitan Lima. We ask you to support us with this cause, completing this questionnaire as honestly as possible.

We remind you that this questionnaire is anonymous and confidential. Please do not write your name. All the information you provide will be strictly confidential, no one will know what you answered. Although the educational institution is collaborating with the study, they will not have access to any of these questionnaires. Please, feel confident to respond freely and without fear of being criticized or sanctioned. Thank you in advance for your cooperation.

Instructions

1. Do not write your first or last name.
2. Answer all questions as honestly as possible.
3. If you have any questions, please raise your hand and ask the pollster in private.

General information

Age: _____ years. Gender: ( ) Male ( ) FemaleDistrict / urbanization in which you live: _____
Type of educational institution which you work: Public ( ) Private ( )Religious ( )
District / urbanization which you work: _____
How many years do you teach? _____ How many years do you teach 5^{th}/6^{th} grades? _____
Teaching area: ( )Science ( )Mathematic ( )Grammar ( ) English ( )Physics
Other: _____
Instruction level: Graduate program: ( ) Unfinished studies ( )Graduate ( )Master ( )Doctor
Technical program: ( ) Unfinished studies ( )Graduate ( )Master ( )Doctor
Others: _____

Environmental awareness (A)

How do you feel about the environmental problems of Peru and its district? When it refers to ...:

1	The quality of drinking water	Bad	Indifferent	Good
2	The level of contamination or waste produced by businesses, farms and industries nearby	Bad	Indifferent	Good
3	The indiscriminate use of chemical products in foods such as fertilizers and pesticides	Bad	Indifferent	Good
4	The shortage of water	Bad	Indifferent	Good
5	The extinction of native animals and plants	Bad	Indifferent	Good
6	The protection of natural reserves such as: National Reserve of the Ballestas Islands, Titicaca Lake, etc.	Bad	Indifferent	Good
7	The deforestation of the Amazon	Bad	Indifferent	Good
8	Urban development	Bad	Indifferent	Good
9	The accumulation of garbage in the streets	Bad	Indifferent	Good
10	Sound pollution	Bad	Indifferent	Good
11	The indiscriminate use of energy caused by luminous signs, luminary in the streets, etc.	Bad	Indifferent	Good

Environmental knowledge (K)

To what extent you agree or disagree with the following statements?

12	We are approaching the limit of the number of people that the Earth can support	Totally disagree	Disagree	Agree	Totally agree
13	Humans have the right to modify the natural environment to meet their needs	Totally disagree	Disagree	Agree	Totally agree
14	When humans interfere with nature, negative consequences often occur	Totally disagree	Disagree	Agree	Totally agree
15	Science and technology can overcome any environmental problem.	Totally disagree	Disagree	Agree	Totally agree
16	Humans are severely abusing the environment.	Totally disagree	Disagree	Agree	Totally agree
17	The Earth has many natural resources and we have learned how to protect them.	Totally disagree	Disagree	Agree	Totally agree
18	Plants and animals have as much right as humans do to exist.	Totally disagree	Disagree	Agree	Totally agree
19	The balance of nature is strong enough to deal with the impacts of modern industrialists.	Totally disagree	Disagree	Agree	Totally agree
20	Despite our acquired human abilities, humans are still subject to the laws of nature.	Totally disagree	Disagree	Agree	Totally agree
21	The so-called "ecological crisis" that confronts humanity, has been greatly exaggerated.	Totally disagree	Disagree	Agree	Totally agree
22	The Earth has limited space and resources.	Totally disagree	Disagree	Agree	Totally agree
23	Humans were destined to rule over nature.	Totally disagree	Disagree	Agree	Totally agree
24	The balance of nature is very delicate and easily altered.	Totally disagree	Disagree	Agree	Totally agree
25	Maintaining economic growth is more important than protecting the environment.	Totally disagree	Disagree	Agree	Totally agree
26	I am well informed about environmental issues in Peru.	Totally disagree	Disagree	Agree	Totally agree
27	Environmental problems are reported by the media (radio, television, newspapers and magazines)	Totally disagree	Disagree	Agree	Totally agree
28	Fishermen and farmers know a lot about environmental issues.	Totally disagree	Disagree	Agree	Totally agree
29	There is a lot that, as a person, I can do to protect the environment in my country.	Totally disagree	Disagree	Agree	Totally agree
30	I am willing to increase my taxes to protect the environment in my country.	Totally disagree	Disagree	Agree	Totally agree
31	I would be willing for the government to reallocate the existing money to protect the environment in my country.	Totally disagree	Disagree	Agree	Totally agree
32	A person can influence how environmental problems are resolved.	Totally disagree	Disagree	Agree	Totally agree
33	Working individually and on my own, can influence the solution of environmental problems.	Totally disagree	Disagree	Agree	Totally agree
34	Asking for support from people with power is the most effective way to influence how environmental problems are resolved.	Totally disagree	Disagree	Agree	Totally agree
35	Working with others can influence the solution of environmental problems.	Totally disagree	Disagree	Agree	Totally agree
36	Chance determines how environmental problems are resolved.	Totally disagree	Disagree	Agree	Totally agree
37	I can influence the resolution of environmental problems in my school / community / district / country using action strategies.	Totally disagree	Disagree	Agree	Totally agree

Environmental attitude (A)						
How often you have had the following experiences marking with a cross (X) the option that best represents you?						
38	Participate in outdoor experiences such as hiking, camping, going to the beach, etc.	Never	Sometimes	Frequently	Almost	Always
39	Motivate parents to take care of the environment	Never	Sometimes	Frequently	Almost	Always
40	I am a teacher who encourages students to take care of the environment	Never	Sometimes	Frequently	Almost	Always
41	Watch TV shows with an environmental message	Never	Sometimes	Frequently	Almost	Always
42	Read newspapers and magazines with an environmental message	Never	Sometimes	Frequently	Almost	Always

Environmental skills and action							
Circle YES or NO to indicate what actions you have taken or could take related to environmental problems. If you choose YES, also indicate how effective you think this action was.							
43	Write a letter to the newspaper.	YES	NO	Not at all	Slightly	Moderately	Extremely
44	Go to a meeting	YES	NO	Not at all	Slightly	Moderately	Extremely
45	Make a formal presentation at my school or elsewhere	YES	NO	Not at all	Slightly	Moderately	Extremely
46	Read or look for information	YES	NO	Not at all	Slightly	Moderately	Extremely
47	Call a public official	YES	NO	Not at all	Slightly	Moderately	Extremely
48	Report to the company / person causing the damage	YES	NO	Not at all	Slightly	Moderately	Extremely
49	Create an action group in favor of the environment	YES	NO	Not at all	Slightly	Moderately	Extremely
50	Sign a petition	YES	NO	Not at all	Slightly	Moderately	Extremely
51	Give a donation to an environmental cause	YES	NO	Not at all	Slightly	Moderately	Extremely
52	Other (specify) _____	YES	NO	Not at all	Slightly	Moderately	Extremely
53	None of the above	YES	NO	Not at all	Slightly	Moderately	Extremely

Thank you very much for your collaboration and honest information. Your contributions will be very important to improve the environmental education of Peruvians.

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Auxiliary Appendix 1

School Administrator Consent

TO WHOM IT MAY CONCERN:

Of my greatest consideration:

It is pleasant to address you to greet you cordially and introduce Dr. Sandra Elizabeth Huamán Pastorelli, a professor at the Faculty of Administrative Sciences and Human Resources with DNI No. 10137511, who is currently developing an investigation into the environmental literacy of students and teachers of 5th and 6th grade of primary public and private schools in Metropolitan Lima.

The topic is relevant, it will allow us to know the conscience, knowledge, attitude, skills and actions regarding the environmental issue that adolescents and their teachers have, which is necessary to be able to provide solutions in the future for the care and protection of the environment.

In this regard I ask you, please, to provide the facilities that the case merits, to make possible the achievement of the academic objectives required by the mentioned teacher.

Thanking the attention, you give to the present, I take the opportunity to express my personal consideration and appreciation.

Signature

Auxiliary Appendix 2

Student Letter of Consent

ASSENT TO PARTICIPATE IN RESEARCH

Environmental Literacy of Peruvian Middle School Students and their Teachers of Private and Public Schools

1. My name is Sandra. I am a researcher at the Harvard Extension School.

2. We are asking you to take part in a research study because we are trying to learn more about your awareness, knowledge, attitude, skills and action related with the environment.

3. If you agree to be in this study we will give you a survey to resolve some questions about environmental literacy and its components

4. You do not have any risk to participate in this research.

5. The research will help you and your teachers to resolve some gaps about the environmental awareness, knowledge, attitude, skills, and action.

6. Please talk this over with your parents before you decide whether or not to participate. We will also ask your parents to give their permission for you to take part in this study. But even if your parents say “yes” you can still decide not to do this.

7. If you don’t want to be in this study, you don’t have to participate. Remember, being in this study is up to you and no one will be upset if you don’t want to participate or even if you change your mind later and want to stop.

8. You can ask any questions that you have about the study. If you have a question later that you didn’t think of now, you can call me (51) 979954685 or ask me next time.

9. Signing your name at the bottom means that you agree to be in this study. You and your parents will be given a copy of this form after you have signed it.

_____ _____

Name of Child Date

Auxiliary Appendix 3

Parent Permission Form

Key Information

The following is a short summary of this study to help you decide whether you want your child to be a part of this study. More detailed information is listed later in this form.

Why is my child being invited to take part in a research study?
Your child was selected to participate in the Peruvian environmental literacy research among 5th and 6th grade students in public and private schools located in the metropolitan area of Lima, capital of Peru.

What should I know about a research study?
Someone will explain this research study to you and your child.
Whether or not you take part is up to you and your child.
Your child's participation is completely voluntary.
You and your child can choose not to take part.
You and your child can agree to take part and later change your mind.
You and your child's decision will not be held against you.
You and your child's refusal to participate will not result in any consequences or any loss of benefits that you and your child are otherwise entitled to receive.
You and your child can ask all the questions you want before you decide.

Why is this research being done?
My research is intended to adopt a suitable environmental education path for Latin American education system in school students and their teachers and to raise their environmental literacy levels. Further, my investigation is projected to identify the shortcomings of environmental literacy in primary school teachers and students.
How long will the research last and what will my child need to do?
We expect that your child will be in this research study for a half hour only one day.
Is there any way being in this study could be bad for my child?
We don't believe there are any risks for your child from participating in this research.

Will being in this study help my child in any way?
We cannot promise any benefits to you or others from your taking part in this research. However, possible benefits include the real situation of your child and how we can help him/her in environmental subjects.

Detailed Information
The following is more detailed information about this study in addition to the information listed above.
What is the purpose of this research?
The purpose of this research is to provide insight into students' environmental literacy components. This study will determine the levels of environmental literacy, measured in

the following components: awareness (A), knowledge (K), attitude (A), skills (S), and action (A) (called as AKASA). These components levels will measure in V Cycle primary school (5th and 6th grade) students and their teachers in private and public schools of the metropolitan area of Lima and the possible comparisons between students and teachers, and private and public schools.

How long will my child take part in this research?
The child´s data collection survey is going to develop in less than 50 minutes at the same time when his/her teacher is surveyed too.

What can I expect if my child takes part in this research?
The results of this research should help a starting point to assist environmental specialists, teachers, and authorities in the evaluation and the improvement of the EE curriculum for Peru and Latin American countries. Beyond this, no individual teacher's responses will ever be singled out in reports or presentations of the results of this survey. The project team will forward a summary of the survey results to your school.

What happens if I or my child say yes, but I or my child change our minds later?
Your child's information or samples that are collected as part of this research will not be used or distributed for future research studies, even if all of your child's identifiers are removed.

If my child takes part in this research, how will their privacy be protected? What happens to the information you collect?
By law, the study team must release certain information to the appropriate authorities if at any time during the study there is concern that child abuse or elder abuse has possibly occurred or you or your child disclose a desire to harm yourself or others.

If identifiers are removed from your child's identifiable private information or identifiable samples that are collected during this research, that information or those samples could be used for future research studies or distributed to another investigator for future research studies without you or your child's additional informed consent.

Who can I talk to?
If you have questions, concerns, or complaints, or think the research has hurt your child, talk to the research team at Sandra Huaman-Pastorelli/shuamanp@usmp.pe / Cellphone : (51) 979954685
This research has been reviewed and approved by the Harvard University Area Institutional Review Board ("IRB"). You may talk to them at (617) 496-2847 or cuhs@harvard.edu

Signature of Parent Date

Printed Name of Parent

Auxiliary Appendix 4

Teachers Permission Form

Key Information

The following is a short summary of this study to help you decide whether to be a part of this study. More detailed information is listed later in this form.

Why am I being invited to take part in a research study?

We invite you to take part in a research study because you are an valuable agent into the environmental education of fifth and sixth graders who study in private and public schools located in the metropolitan area of Lima, capital of Peru.

What should I know about a research study?

- Someone will explain this research study to you.
- Whether or not you take part is up to you.
- Your participation is completely voluntary.
- You can choose not to take part.
- You can agree to take part and later change your mind.
- Your decision will not be held against you.
  - Your refusal to participate will not result in any consequences or any loss of benefits that you are otherwise entitled to receive.
- You can ask all the questions you want before you decide.

Why is this research being done?

It is hoped that this survey will result in an improved understanding of environmental literacy in the middle grades across Peruvian schools and the contribution of these selected environmental programs and approaches to that end. My research is intended to adopt a suitable environmental education path for Latin American education system in school students and their teachers and to raise their environmental literacy levels.

How long will the research last and what will I need to do?

The data collection survey for teachers is going to develop in less than 50 minutes at the same time when your students are surveyed. We will expect to answer a confident survey with similar four section as your students' surveys.

Is there any way being in this study could be bad for me?

We don't believe there are any risks from participating in this research.

Will being in this study help me in any way?

We cannot promise any benefits to you or others from your taking part in this research. However, possible benefits include the real situation of your students and how you can help them in environmental subjects.

Detailed Information

The following is more detailed information about this study in addition to the information listed above.

What is the purpose of this research

You will be asked to provide insight into teacher's environmental literacy components. This study will determine the levels of environmental literacy, measured in the following components: awareness (A), knowledge (K), attitude (A), skills (S), and action (A) (called as AKASA). These components levels will measure in V Cycle primary school (5th and 6th grade) students and their teachers in private and public schools of the metropolitan area of Lima and the possible comparisons between students and teachers, and private and public schools.

Background

In Peru, there is little support of Environmental education goals in the school curriculum. The Peruvian Curriculum of Basic Education (MINEDU, 2016) visualizes and shapes the students' rights to learn in response to the challenges of the present and the diverse needs, interests, aspirations, values, and ways of thinking, to interconnect with the environment and forms of life valued by Peruvian society.

Therefore, to achieve these policy goals, it is critical to understand the gap in EE in Peruvian primary schools. The solution to environmental problems depends on conscious modification of student behavior, which realized with an appropriate EE starting during the childhood school years. Within the framework of sustainable development, technology and the law are not sufficient for solving ecological problems.

Peruvian youth, like many other Latin American counterparts, suffer from poor primary education. Among other basic needs, there is a lack of literacy, and efforts have been made to improve it. Nevertheless, environmental literacy has not been taken into account as seriously as, for instance, mathematics. In Peru, the environment is mentioned only very briefly in the primary curriculum, which makes it end as a shallow product that superficially tries to show green actions like trying to use fewer plastic bags when oil and standard batteries are disposed of entirely irresponsibly or when potable water is used for gardening.

How long will I take part in this research?

However, it will be administered by a study research member in a supervised school setting approved by the School Principal during normal school hours, and will take approximately 50 minutes to complete.

What can I expect if I take part in this research?

The results of this research should help a starting point to assist environmental specialists, teachers, and authorities in the evaluation and the improvement of the EE curriculum for Peru and Latin American countries. Beyond this, no individual teacher's responses will ever be singled out in reports or presentations of the results of this survey. The project team will forward a summary of the survey results to your school.

What happens if I say yes, but I change my mind later?

You can leave the research at any time it will not be held against you. Please understand that your participation is voluntary. Refusal to participate will involve no penalty or loss of benefits to which your participation is entitled.

If I take part in this research, how will my privacy be protected? What happens to the

information you collect?
Your information or samples that are collected as part of this research will not be used or distributed for future research studies, even if all of your identifiers are removed.
If identifiers are removed from your identifiable private information or identifiable samples that are collected during this research, that information or those samples could be used for future research studies or distributed to another investigator for future research studies without your additional informed consent.
Who can I talk to?
If you have questions, concerns, or complaints, or think the research has hurt you, talk to the research team at Sandra Huaman-Pastorelli /shuamanp@usmp.pe / Cellphone : (51) 979954685. This research has been reviewed and approved by the Harvard University Area Institutional Review Board ("IRB"). You may talk to them at (617) 496-2847 or cuhs@harvard.edu.

Signature Block for Adult Subject

Your signature documents your permission to take part in this research.

_____ _____

Signature of Subject Date

_____

Printed Name of Subject

_____ _____

Signature of Person Obtaining Consent Date

_____

Printed Name of Person Obtaining Consent

Signature Block for the Witness to the Short Form Informed Consent Process

My signature below documents that the information in the consent document and any other written information was accurately explained to, and apparently understood by, the subject, and that consent was freely given by the subject.

_____ _____

Signature of Witness to Consent Process Date

_____

Printed Name of Person Witnessing Consent Process