



Training plan for the inhabitants of the Miguelillo-Portoviejo site in the event of landslide and flooding risks

Plan de capacitación ante riesgos de deslaves e inundaciones para los habitantes del sitio Miguelillo-Portoviejo

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Abstract

Environmental education is one of the best tools for the identification of problems related to pollution that affect the well-being of living beings and for the search of solutions for each case, and taking into account aptitudes and attitudes of respect for the same. In congruence with the above, the research whose results are presented here was developed with the objective of supporting the implementation of a training plan aimed at the inhabitants of the Miguelillo-Portoviejo site to face the risks of landslides and floods. For the execution of the study, the application of theoretical scientific methods (analysis and synthesis and induction and deduction) was used, which facilitated the evaluation of the information gathered through empirical methods such as observation and support techniques such as interviews and surveys. With the data recorded in the study, it was possible to demonstrate the lack of knowledge on environmental issues possessed by the residents. In conclusion, it has been considered that systematic training actions provide benefits in the presence of natural disasters and their response to these events, so it is important to provide constant training for the inhabitants.

Key words: Environmental awareness, natural disasters, environmental education, training, before and after test.

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Resumen

La educación ambiental, constituye una de las mejores herramientas para la identificación de problemas relacionados con la polución que afectan el bienestar de los seres vivos y para la búsqueda de las soluciones para cada caso, y teniendo en cuenta aptitudes y actitudes de respeto al mismo. En congruencia con lo anterior se desarrolló la investigación cuyos resultados se presentan, con el objetivo de sustentar la implementación de un plan de capacitación dirigido a los habitantes del sitio Miguelillo-Portoviejo para afrontar riesgos de deslaves e inundaciones. Para la ejecución del mismo se recurrió a la aplicación de métodos científicos de orden teórico (análisis y síntesis e inducción deducción) lo cual facilitó la valoración de la información recopilada a través de métodos empíricos como la observación y técnicas de apoyo como las entrevistas y las encuestas. Con los datos registrados en el estudio se logró evidenciar carencias sobre los conocimientos en temas ambientales que poseen los moradores. A modo concluyente se ha considerado que las acciones de capacitación sistemática aportan beneficios ante la presencia de desastre naturales y sus acciones de respuesta ante estos eventos, por lo que es importante la constante capacitación para los habitantes.

Palabras clave: Sensibilización medioambiental, catástrofes naturales, educación medioambiental, formación, antes y después de la prueba

Introduction

Environmental education prepares people to generate changes in sustainable development, focusing on pedagogical and ecological methods; it helps to identify problems related to pollution and the search for solutions, taking into account skills and attitudes of respect for it. The International Union for Conservation of Nature. Pallo (2020) defines environmental education as a process that consists of recognizing values and clarifying concepts to create skills and attitudes necessary to understand and appreciate the relationship between human beings, their culture and their biophysical environment.

In the face of natural disasters, environmental education is considered a tool that favors people in the knowledge about the risks, threats and vulnerability to which they are exposed; it facilitates understanding in disaster management, allows understanding the characteristics of the habitat and acquiring the ability to act on it, reducing the probability of disasters and responding adequately to the existence of natural phenomena to which they are defenseless (Ordóñez et al., 2018).

In Ecuador, limitations in environmental education are evident and there is no national or territorial projection that favors any change in this problem. For this reason, it is necessary to address environmental issues in order to think about the actions that are

not carried out due to lack of knowledge and that harm the environment and people (Pallo, 2020).

Natural disasters occur in rural areas of the province of Manabí, the most common being floods and landslides. The site Miguelillo, in the canton of Portoviejo, is prone to constant flooding and, in recent years, new calamities such as landslides have occurred; the inhabitants of the sector do not have adequate knowledge of how to deal with these events, as evidenced last February 2017.

According to what was stated, the objective of the research is to implement a training plan aimed at the inhabitants of the Miguelillo-Portoviejo site to face the risks of landslides and floods.

Materials and methods

For the development of the research, the following specific activities were carried out: identify the community's response needs to landslide and flood risks, develop a training plan for the inhabitants of the Miguelillo-Portoviejo site to face landslide and flood risks, and evaluate the progress obtained from the intervention of the training plan.

The study was located at the Miguelillo site in the canton of Portoviejo, with geographic coordinates XPVJ+7GH, C. Abdón Calderón, Portoviejo (Google LLC, 2021). For the execution of this study we resorted to the application of theoretical scientific methods (analysis and synthesis and induction and deduction) which facilitated the assessment of the information collected through empirical methods such as observation and support techniques such as interviews and surveys (Pérez et al., 2017).

A sample of 82 inhabitants of the community (45 men and 37 women), previously selected, whose ages ranged between 18 and 80 years, was formed. The degree of knowledge before and after the intervention of a training plan for landslide and flood risks was evaluated; the research is declared to be quasi-experimental (Pulido et al., 2020).

We worked with two groups, control and experimental, with the objective of confirming the capture of what was exposed in the training. However, the control group was not given the training designed according to the results obtained in the pretest; this was done in order to relate the data obtained in both groups and verify the effectiveness of the proposal.

As a first point to be executed, the response needs of the inhabitants to landslide and flood risks were identified; in this section, interview and survey techniques were applied (Escobar et al., 2018) which allowed obtaining relevant data and information in the research through the inhabitants.

The survey applied is of a diagnostic nature with dichotomous answers, it was selected from the study of (Cedeño, 2018) adapted to the present research, with the purpose of establishing the response needs possessed by the inhabitants of the community. The characteristics of the respondents (age and sex) were taken into account. The survey

was subjected to an analysis in Cronbach's alpha, this is a measure of the internal consistency of a questionnaire or a set of questions where the reliability of the applied technique is determined; in this way the information collected was subjected to a correlation analysis between the answers of different questions, as well as an ANOVA analysis.

Taking into account the results obtained in the first survey, we proceeded to the elaboration of the training design in the community of Miguelillo; didactic support materials (copies, graphs, notebooks, pens) and audiovisual equipment (projector, computer, loudspeaker) were used at the time of the meetings in order to obtain a greater understanding of the topics to be presented.

As a final section, in order to corroborate the contribution presented through the training, the survey conducted at the beginning of the research was applied again to gather the necessary information; the level of knowledge acquired by the villagers was verified and the differences were assessed by comparing the results between the two measurements.

Results

Bivariate correlations were applied to determine if there were inverted questions. Question nine (9) was found to be inverted, so the values were transformed to better fit the statistical analysis.

Once the procedure was completed, the reliability was corroborated, resulting in a Cronbach's alpha of 0.714. The value of Cronbach's alpha is in a range between 0 and 1, where a value closer to 1 indicates greater internal consistency and a value closer to 0 indicates lower internal consistency.

In this case, Cronbach's alpha is 0.76 for a 12-question questionnaire with dichotomous response options. This value suggests that the questionnaire has a moderate internal consistency. This means that the questions in the questionnaire are related to each other and measure a similar construct, but there is some variability in the extent to which the questions are related.

In general, a Cronbach's alpha of 0.7 or higher is considered acceptable for a questionnaire. Therefore, Cronbach's alpha of 0.76 for this questionnaire indicates that the questions are related to each other and are probably measuring the construct for which they were designed. However, it is important to keep in mind that Cronbach's alpha is not the only measure of questionnaire validity and is not an absolute measure of internal consistency, so it is important to consider other aspects of the questionnaire and the research as a whole before reaching definitive conclusions.

Table 1. *Instrument reliability statistics with Cronbach's alpha.*

Cronbach's alpha	N of elements
0,714	12

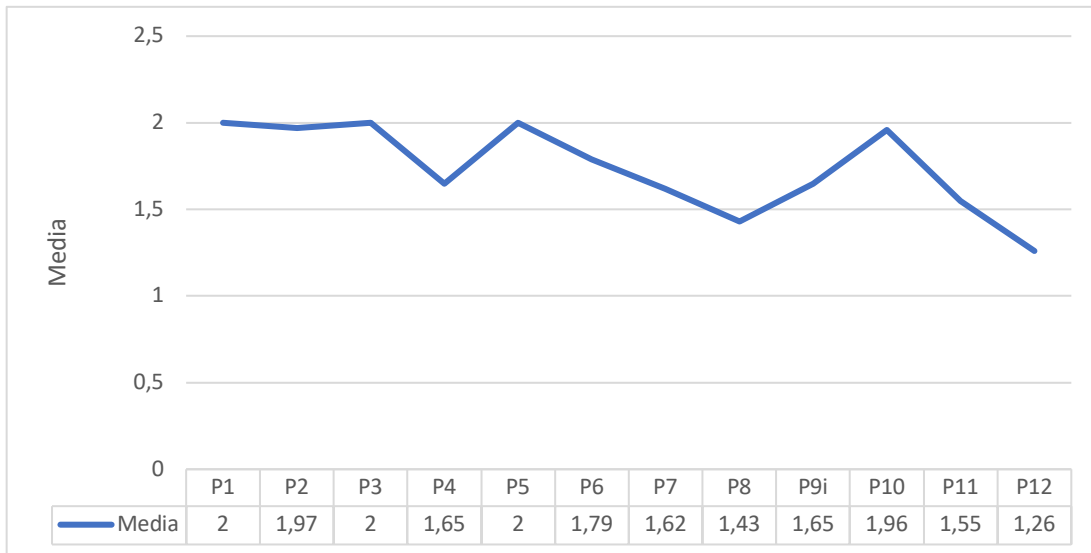
Table 2 shows the frequencies of dichotomous responses to the 12 questions in the questionnaire. The results of the questions indicate that most of the respondents know the meaning of flood and landslide, and that these have occurred in the community. However, a majority do not know how to act in the face of these natural disasters. Environmental education is considered important to prevent these disasters, but it has not been given in the community. Most of the people surveyed have not received talks on environmental education and some have not received surveys on the subject. However, some people have discussed the issues of floods and landslides at home.

Table 2. Responses to Questionnaire on Landslide and Flood Hazards Training

Ask	Option	Frequency	%
P1	No	0	0%
	Yes	164	100%
P2	No	5	3%
	Yes	159	97%
P3	No	0	0%
	Yes	164	100%
P4	No	57	35%
	Yes	107	65%
P5	No	0	0%
	Yes	164	100%
P6	No	35	21%
	Yes	129	79%
P7	No	63	38%
	Yes	101	62%
P8	No	94	57%
	Yes	70	43%
P9i	No	57	35%
	Yes	107	65%
P10	No	7	4%
	Yes	157	96%
P11	No	74	45%
	Yes	90	55%
P12	No	122	74%
	Yes	42	26%

The data in Figure 1 correspond to the means of the responses to each question in a questionnaire. The questions have response options on a Likert scale, where 1 means "No" and 2 means "Yes".

Figure 1. Comparison of averages for each item



In general, it is observed that the majority of respondents answered "Yes" to questions related to knowledge about floods and landslides, and that these have occurred in the community. However, there is a tendency towards "No" answers to questions related to preparedness and environmental education to manage these natural disasters.

In detail:

- Knowledge of the meaning of flood: The average is 2.00, indicating that most of the respondents know the meaning of flood.
- Knowledge of the meaning of landslide: The average is 1.97, which shows that most of the respondents know the meaning of landslide.
- Existence of flooding in the community: The average is 2.00, which shows that most of the people surveyed responded that flooding has occurred in the community.
- Perception of natural disaster danger in the community: The average is 1.65, which reflects that most of the people surveyed do not perceive a natural disaster danger in the community.
- Existence of landslides in the community: The average is 2.00, which shows that most of the people surveyed responded that landslides have occurred in the community.
- Knowledge about environmental education: The average is 1.79, this result expresses that most of the people surveyed do not know what environmental education is.
- Knowledge of how to act in the event of flooding: The average is 1.62, indicating that most respondents do not know how to act in the event of a flood.
- Knowledge of how to act in the event of a landslide: The average is 1.43, which shows that most of the people surveyed do not know how to act in the event of a landslide.

- Previous experience with environmental education surveys: The average is 1.65, which shows that most respondents have not received environmental education surveys before.
- Importance of environmental education in the face of floods and landslides: The average is 1.96, which reveals that most of the people surveyed consider it relevant.
- Household dialogue: the mean corresponds to 1.55, suggesting that most respondents do not talk about flood and landslide issues in their homes.
- Environmental education talks in the community: the mean response is 1.26, indicating that most of the respondents have not received environmental education talks in their community.

Inter-item correlations

The data presented in Table 3 show the correlations between the answers to the different questions. Each number in the table represents the correlation coefficient between two specific questions. A correlation coefficient is a number ranging from -1 to 1 that indicates the relationship between two variables. A value of 1 indicates a perfect positive correlation, meaning that the variables are completely correlated and as one increases, the other also increases. A value of -1 indicates a negative perfect correlation, which means that the variables are completely correlated and as one increases, the other decreases. A value of 0 indicates that there is no correlation between the variables.

In this data set, it can be seen that there are several questions that have a significant positive correlation. For example, question Q2 (Knows the meaning of landslide) has a significant positive correlation with question Q6 (Knows what environmental education is) with a coefficient of 0.340. This means that people who know the meaning of landslide also have more knowledge about environmental education.

In addition, it can be seen that there is a significant positive correlation between question P7 (Knows how to act in the event of floods) and question P8 (Knows how to act in the event of landslides) with a coefficient of 0.225. This suggests that people who know how to act in the event of a flood also know how to act in the event of a landslide.

However, there are also some questions that do not have a significant correlation. For example, question Q2 (Do you know the meaning of landslide) and question Q4 (Do you see any danger of natural disaster in the community) have a correlation coefficient of 0.094, indicating that there is no significant relationship between knowing the meaning of landslide and perceiving danger of natural disaster in the community.

In general, these data suggest that there is a relationship between knowledge about environmental education and preventive actions in the face of natural disasters such as floods and landslides. However, it is also important to note that there are some questions that do not have a significant correlation, suggesting that other factors may also be influencing perception and knowledge about these issues.

It is important to keep in mind that correlation coefficients only measure the relationship between two variables, they do not indicate causation. Therefore, although there is no significant relationship between these two questions, there could be other factors or variables that influence the perception of natural disaster hazard.

Table 3. Correlations between responses to the Questionnaire on Training for Landslide and Flood Hazards

	P2	P4	P6	P7	P8	P9i	P10	P11	P12
P2	1,000	,094	,340**	,225**	,081	,168*	,664**	,053	,104
P4	,094	1,000	,057	,319**	,086	,166*	,036	,367**	,340**
P6	,340**	,057	1,000	,078	,269**	,401**	,405**	,245**	,306**
P7	,225**	,319**	,078	1,000	,175*	,055	,081	,342**	,406**
P8	,081	,086	,269**	,175*	1,000	,475**	,121	,337**	,482**
P9i	,168*	,166*	,401**	,055	,475**	1,000	,163*	,290**	,428**
P10	,664**	,036	,405**	,081	,121	,163*	1,000	,112	,124
P11	,053	,367**	,245**	,342**	,337**	,290**	,112	1,000	,420**
P12	,104	,340**	,306**	,406**	,482**	,428**	,124	,420**	1,000

** . Correlation is significant at the 0.01 level (bilateral).

* . The correlation is significant at the 0.05 level (bilateral).

Differences between Experimental and Control groups in the Posttest

The results of the statistical analysis performed indicate that there are significant differences between the experimental group and the control group as a whole. The ANOVA analysis with one degree of freedom reveals that questions 7, 8 and 12 present significant differences between both groups, as can be seen in Table 4. This suggests that the experimental group has had a significant impact on the answers to these questions compared to the control group, indicating that the treatment or intervention applied to the experimental group has had an effect on the answers to these questions. In summary, it can be concluded that there are significant differences between the experimental group and the control group as a whole.

Table 4. ANOVA results to establish differences between Experimental and Control Groups.

	Sig.
P1	*
P2	,692
P3	*
P4	,697
P5	*
P6	,136
P7	,000
P8	,004
P9	,557
P10	,653

P11	,013
P12	,000

* Not applicable due to 100% affirmative response.

The data in Table 5 correspond to the answers to specific questions in a questionnaire where the results are compared between two groups: the experimental group and the control group. The questions have dichotomous answer options, "No" or "Yes".

In general, it is observed that in questions 7, 8 and 12 the experimental group has a higher percentage of "Yes" answers compared to the control group.

In detail is the following analysis:

- Question 7: Do you know how to act in case of flooding? The experimental group has a percentage of 76 "Yes" answers and the control group has a percentage of 48 "Yes" answers, which means that the experimental group has a greater knowledge of how to act in the event of a flood compared to the control group.
- Question 8: Do you know how to act in the event of a landslide? The experimental group has a percentage of 50 "Yes" answers and the control group has a percentage of 31 "Yes" answers, which means that the experimental group has a greater knowledge of how to act in the event of a landslide compared to the control group.
- Question 12: Have you given environmental education talks in the community? The experimental group has a percentage of 50 "Yes" answers and the control group has a percentage of 0 "Yes" answers, which in the experimental group have given more environmental education talks compared to the control group.

Table 5. Variables with significant differences between Experimental and Control Groups.

		P7		P8		P12	
		No	Yes	No	Yes	No	Yes
Group	Experimental	21	63	39	45	42	42
	Control	42	38	55	25	80	0
Total		63	101	94	70	122	42

These data suggest that the experimental group has had greater access to information and preparation on how to act in the face of floods and landslides and has received environmental education talks, compared to the control group.

Differences between groups Test -Post test.

The data in Table 6 correspond to the results of an analysis of variance (ANOVA) to evaluate statistical significance.

The data correspond to the results of an ANOVA analysis to compare the means of the responses to a questionnaire before and after an educational intervention. The value presented next to each question is the significance level obtained for that question.

In general, it is observed that for questions P4, P6, P7, P8, P9, P11 and P12 a significance level of less than 0.05 was obtained, indicating that there are significant differences in the answers to these questions before and after the educational intervention. However, for question P10, a significance level greater than 0.05 was obtained, indicating that there are no significant differences in the answers to that question before and after the educational intervention.

Table 6. ANOVA results to evaluate the differences between Test and Posttest.

Questions	Sig.
P1	*
P2	,175
P3	*
P4	,000
P5	*
P6	,000
P7	,006
P8	,000
P9i	,000
P10	,249
P11	,000
P12	,000

* Not applicable due to 100% affirmative response.

The data correspond to the results of a test-posttest questionnaire applied before and after an educational intervention. The questionnaire consists of 12 questions with dichotomous answer options (Yes/No or 1/2).

In general, it can be observed that in most of the questions there is an increase in the percentage of people answering "Yes" after the educational intervention, especially in the questions related to the knowledge and skills necessary to act in the event of natural disasters such as floods and landslides. For example, in question Q7 (Do you know how to act in the event of floods?), the percentage of people who answer "Yes" increases from 41 to 50, and in question Q8 (Do you know how to act in the event of landslides?), the percentage of people who answer "Yes" increases from 23 to 38.

There is also an increase in the percentage of people who consider that environmental education is important to prevent natural disasters and that these issues are discussed in their homes.

In contrast, in question Q9 (Is this the first time you have received this type of survey on environmental education?) the percentage of people answering "Yes" decreases significantly from 57 to 0, indicating that most people had already received this type of survey previously.

Table 7. *Differences in frequencies between Test and Posttest.*

		Test	Posttest
P4	No	44	13
	Yes	38	69
P6	No	27	8
	Yes	55	74
P7	No	40	23
	Yes	42	59
P8	No	63	31
	Yes	19	51
P9	No	25	82
	Yes	57	0
P10	No	5	2
	Yes	77	80
P11	No	53	21
	Yes	29	61
P12	No	82	40
	Yes	0	42

Overall, these data suggest that the educational intervention had a positive impact on people's knowledge and skills to respond to natural disasters, as well as in

Trainings are favorable techniques for the development of the person; however, these also comprise negative effects such as risks in productivity which, in general terms, is understood as a delay before production due to the deficit of knowledge that is previously had from the training and the collaboration of third parties, comprises time and money; in turn, erroneous information at the time of the trainings brings consequences in their environment when applying the thematic in the field; however, these support tools bring more benefits than loss by providing knowledge in different topics (Amigo et al., 2016).

In congruence with the above, (Villanueva, 2018) points out that trainings play an important role in achieving the fulfillment of tasks, in the development of people's strengths and skills, as well as their abilities. With respect to natural disasters it is necessary to be forewarned; trainings favor with relevant information for learners, in this way they obtain essential knowledge to face these conflicts. Landslides and floods are unexpected events for which we must be prepared and this support technique helps us not only to be prepared, but also to reduce the impacts they cause.

Situations that coincide with the present research, which demonstrates the need for motivations through training, workshops and other activities that raise awareness among the community's inhabitants about the knowledge and importance of prior actions and actions in the event of natural disasters.

It is emphasized that the education of a person begins at home, since it is here where the habits and customs of the subject are formed, so that the home is the primary source of learning in social community, where day by day it is expected to acquire new knowledge to put into practice (Martínez and Villa, 2017); however, the environmental

problem has increased so much in these years that the GADs are taking action measures to address the situation and activities that were previously carried out in educational institutions, become a priority of the environmental department of the respective GADs for subsequent socialization (Gárate et al., 2020).

The study agrees with the need for local authorities to take action on environmental problems, not only through preventive and theoretical measures, but also through sanctions in some cases.

Conclusions

The analysis of the information derived from the application of the first survey showed that the inhabitants of the sector have basic knowledge of certain concepts about the subject matter taught; however, they demonstrate shortcomings in terms of danger, prevention measures, safety and response to natural disasters (landslides and floods), as well as the lack of environmental education in the community.

The results generated in the application of the first and second surveys show that age influences people's knowledge, since the older the inhabitants were, the less they knew about the subject; however, there was an excellent reception to the training plan, since after having carried out the last phase of the objectives, the degree of uptake increased notably. However, there are still, to a lesser extent, shortcomings among older residents.

The residents belonging to the control group also presented changes in the second survey, although these were not as significant as in the experimental group; however, the difference in the responses between the two stages is due to the interest they showed at the time of the first survey, since once it was carried out they indicated that they wanted to know more about the topic presented.

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