

The Impact of Training in Participatory Research on the Behavior of School Children: An Experiment in Yucatan

Ma. Dolores Viga, Federico Dickinson, Pilar Canto and Ma. Teresa Castillo¹

Human Ecology Department

Centro de Investigación y de Estudios Avanzados del IPN, Unidad Mérida.

Apdo. Postal 73 "Cordemex," 97310, Mérida
México

Abstract

This paper emphasizes the role of Participatory Research (PR) in the socialization and resocialization processes, in which individuals' behavior towards the environment is acquired. We studied PR in the childhood socialization process by teaching it in an elementary school in a rural community in Yucatán, México. An experimental (E) group; and a control (C) group were studied. Only the former received PR methodology instruction, though both were tested before and after the PR course to evaluate the children's concepts of PR, and to identify and measure behavioral changes. The results show that the E group increased in its ability to identify PR characteristics and steps after the PR course. It also exhibited an improvement in skills, and its frequency, manner, and speed of participation were significantly higher than in the C group. Results suggest that E group children effectively modified their school behavior.

Keywords: life-long education, socialization, resocialization, rural, México

Participatory Research and Human Ecology

It has been observed recently (World Bank 1992; WHO 1992; Frazier 1997) that continuing global environmental degradation has negative consequences for health, economic productivity and the use, handling and preservation of natural resources. The study of such consequences, and the elaboration of measures to mitigate or even reverse them, belongs to the realm of human ecology. One of our main challenges as human ecologists is to produce scientific knowledge on the interrelations between human biological status, human sociocultural systems and the biotic and abiotic environment in which humans and sociocultural systems develop. The positive impact of this knowledge is reinforced when applied within a participatory framework involving the people living in an ecosystem in the use of preservation methodologies and technologies for that ecosystem.

Participatory Research (PR) was originally created in Latin America as a theoretical-methodological response to the wide-spread poverty in the region. It involves people in the transformation of their reality through investigation, self-education, and action (Schutter 1981; Schutter and Yopo 1982; Yopo 1982, 1985; Schmelkes 1986; Barquera 1986; Dijk and Durón 1986). PR methodology was applied at a community level in the present study, which is part of a series (Batllori 1992a, 1992b; Castillo and Viga 1994; Castillo, Dickinson, Viga and Lendenchi 1995; Castillo, Viga, Dickinson, Lendenchi, Hoil and Ortega 1997; Viga and Dickinson 1996; Ortega, Hoil, Lendenchi and Santana 1997; Cox 1997; Dickinson, Viga, Arguelles, Gongora and Castillo 1998) generated by a human ecology project conducted in the Yucatán Peninsula between 1990 and 1996 (Ortega and Dickinson 1991; Dickinson and Ortega 1994).

Socialization, Resocialization, and Cultural Changes

The democratic and conscious participation of individuals and groups in the use, conservation and restoration of natural resources is one of the main necessities for the survival of modern civilization (The Ecologist 1995). In the face of accelerated global environmental degradation, cultural survival depends not only on an individual's access to power and wealth, but also on his/her ability to improve his/her well-being, regardless of sex, ethnicity, religion or political preference.

For people to be involved in the improvement of their environment, it is imperative to provide them with the tools to identify, analyze and solve environmental problems. PR is just such a tool, and has been successfully applied in social psychology (Castro 1993; Rodriguez 1994; Goncalves 1997), popular education (Martinic, Tapia, Pascal and Grossi w/d; Pliego 1995; Sampieri 1992; Theesz 1995), rural development (Berlanga 1991), and natural resources use management (Batllori 1992a, 1992b; Mauch 1997). It is also clearly useful in applied human ecology, that is to say the modification

of interactions between sociocultural and ecological (i.e. the biotic and abiotic environment) systems, and human biology.

Human ecologists can use PR in advancing changes in cultures with their own theoretical and practical behavioral rules, symbols, valuative and affective dispositions, communication mechanisms and means of knowledge transmission between social groups. This is accomplished through its use in the socialization and/or resocialization processes, from which people learn cultural rules and communication mechanisms (Krotz 1984). Socialization, which occurs during the childhood years, is the process through which individuals learn the culture of their society, acquiring ways of acting, thinking and feeling, assuming its norms and values, developing abilities and adopting beliefs, symbols and attitudes that allow them to form part of that society. Resocialization occurs throughout an individual's life, allowing experimentation with changes and observable modifications in lifestyle, rhythm and type of daily activities, and in habits, routines and life perception. Through the resocialization process, the individual can adapt to changes for which s/he was not prepared during childhood socialization.

Cultural survival depends on an individual's understanding of the need for appropriate knowledge, attitudes, and values, and how s/he acts to preserve natural resources and the biotic and abiotic environment. Such understanding is built mainly through the socialization process, and to a lesser extent through the resocialization process (Krotz 1984).

Cultural change is defined as the influence of social impulses on human behavior, which subsequently become part of value sets that vary among different societies (Ruch and Zimbardo 1975). This is possible if in the scholastic socialization process students acquire new attitudes towards nature, based on different knowledge and value sets. However, this assumes access to formal education, which is limited in developing countries, particularly in rural areas. Given this, alternatives are needed that provide rural populations with the methodological means to identify, analyze and act to solve environmental problems.

Two such alternatives are life-long education and PR. Life-long education is a complete and coherent process, in which the individual, irrespective of age, is the primary focus, and in which participation and autonomy are basic characteristics (Castrejón and Gutiérrez 1974). PR is an alternative to life-long education (Krotz 1984; Ruch and Zimbardo, 1975) — an alternative that plays an important role in enriching the socialization and resocialization processes. It also fosters interaction between communities and their environment, and between groups and individuals (Castillo, Viga, Dickinson, Lendechei, Hoil and Ortega 1997).

Participatory Research: Philosophy and Theory

PR is a theoretical and practical school of thought that seeks to generate the knowledge needed to involve communities in the analysis and transformation of their reality (Schmelkes 1986; Dijk and Durón 1986). Based on the seminal work of Freire (1978a, 1978b), PR has become an alternative for social change, especially in developing countries. The main objective of PR (Barquera 1986, 55) is for groups or communities to become researchers, producing knowledge that explains their social reality, and then designing an analytical base from which to transform and modify that reality. This transformation or modification positively affects individual, familial, community and environmental well-being. Theoretical characteristics of PR include the search for articulation between theory and practice, the strengthening of popular organization and the motivation to participate, and the establishment of a logical and systematic process linked to everyday, working class life (Dijk and Durón 1986, 25-26). Methodologically, PR is a process of discovery, production and the practical application of knowledge, which incorporates participants' wisdom, values and cultural richness, and responds to the concrete needs of a group, social sector, or community. For more information about PR methodology see Schutter (1981), Yopo (1982), Schutter and Yopo (1982), Dijk and Durón (1986), and Schmelkes (1986).

Agents, Steps and Phases of Participatory Research

A community group implements the PR process by using strategies to identify communal problems among relevant community issues, and producing possible solutions that improve the well-being of community and family. The PR process can be implemented using diverse strategies that allow for problem identification and solution generation, in spite of lack of community interest.

The PR process requires a key group of "facilitators," who are community members interested in working for the benefit of the community. They facilitate communication between the PR group and the community for problem analysis and PR application. Additionally, they identify, diagnose and rank community problems, in order to work towards resolution of those considered most important or urgent.

PR uses a three-step approach of 1) identify, 2) analyze, and 3) act. The first step, "identify," involves conceptualizing the problem, identifying its dimensions and describing its general elements, using the facilitators' and community's experience and knowledge of the problem to be resolved.

The second, "analyze," is a transcendence of mere description of the problem, and a questioning of its composition. This may incorporate other explanatory elements, such as expert opinion or printed sources, that allow for its clear description and a better understanding of its causes and effects. Some of this information may come from scientific sources, whose language community members may not understand. These sources should be "translated," using what some communications specialists call "codification and decodification" (Paoli 1990; González 1994), to allow for their incorporation into the community's language. In the third step, "act," the problem is more widely and objectively defined than in the first step. This new definition feeds a search for problem-related information, the planning of a series of problem-solving actions and identification of strategies with which to implement them.

A PR process has seven stages: 1) convocation, in which the community is invited to join the facilitators; 2) training of the facilitators in PR methodology; 3) problem diagnosis and ranking, in which the most important problems for the community are specified and ranked, one being selected for resolution; 4) analysis and action, in which the previous stage is implemented; 5) evaluation of the difficulties and achievements of the process, such as didactic material use, attendance, participation, motivation, and the group's interest in continued PR methodology application; 6) celebration, in which achievements are celebrated; and finally, 7) continuation of this process, beginning with stage four.

An example of PR process implementation is The Port, a small, rural Yucatecan community in which the PR group received scientific study results, including data on the community's members and environment, generated as part of the previously mentioned human ecology project (Ortega and Dickinson 1991; Dickinson and Ortega 1994). Based on these results, this PR working group created a Community Health Program to be applied at the community, family and individual levels.

Once the program was in place, it was decided to use PR to resolve problems that affected community health, specifically environmental contamination. Once environmental contamination was identified as the problem, outdoor defecation was singled out as one of the principal contaminating agents, due to its severe and adverse health effects. After acquiring information on more efficient waste disposal methods, different kinds of toilets were analyzed. Among these was a "double dry" toilet, which has two chambers used alternately for receiving feces, which then biochemically degrades into inoffensive and non-contaminating organic material. The PR group members seriously considered this toilet as it appeared suitable to local environmental conditions. However, some members were indecisive, and yet others opposed construction of this type of toilet, doubting

that the feces really degraded. In lieu of these doubts, the group decided to acquire more information by visiting the rural, Yucatecan community of San Bernardo, where use of the "double dry" toilet is common. Doubting group members were shown the toilet's efficacy, the group consequently accepting it as a valid possibility.

At this time, the Ministry of Health proposed the construction of another kind of toilet to The Port municipal authorities. In contrast to the "double dry," this type of toilet requires large quantities of water, a sewer and seemed inadequate for local environmental conditions, which include a shallow water table, scarce water supply and large flood-susceptible areas. The PR group did not reject *a priori* either of the two options, but analyzed them, to the point of requesting assistance from experts in the state capitol. In the end, they decided to construct a "double dry" toilet, and test it in local conditions. During the test period, the hurricanes Opal and Roxanne (1995) caused severe flooding in The Port, effecting the toilet's functioning. In response, the PR group members analyzed this problem and identified the modifications required for the toilet to function correctly in local conditions.

Life-long Education, Participatory Research and Children

It has been said that education in the future should include all social classes, especially those that have been excluded from enjoying social wealth. It should be addressed to all age groups, and be given in a holistic and non-specialized way, outside the traditional educational institutions. Achieving this goal would allow for transformation of a society into an "educative city," attaining the total fulfillment of individuals' abilities and the drawing forth of a population's creative potential (Faure, Herrera, Razzak, Lopes, Petrovski and Rahnema 1983).

Education for a population's development should be integral and perennial. "It's no longer a matter of independently acquiring fixed knowledge, but of preparing oneself to develop a learning in constant evolution throughout one's life, and of 'learning to be' (Faure et al. 1983, 16). This is the aim of life-long education, which is understood as a process aimed at individual, social and professional development throughout one's life. It is a measure toward improving the quality of life in each of these aspects, as well as in their totality, and is based in humanistic values such as the spiritual renewal of human beings, equality, democracy, peace and liberty. In pursuing this aim, life-long education establishes objectives at both community and individual levels, the latter objective emphasizing the education of individuals to enable them to make responsible decisions, care for the environment and improve upon their successes.

Two aspects are especially vital in life-long education. The first is the ability of learning to learn. This is developed by including aspects such as self-teaching, self-evaluation, flexibility in learning styles, and the evaluation of new developments in education technology. Second is motivation, required if individuals are to attain the goal of learning throughout their lives, an element essential to this type of education. To engender this motivation, educational content should transcend disciplinary division, be concrete and directly related to the individuals reality.

As mentioned, the philosophy, values and ends of PR are focused towards bettering people's low quality of life by providing the means with which to identify, analyze and act to solve the problems which surround them. Given that this is attained through generation of knowledge about their realities, and taking into account that a vital part of life-long education is that individuals learn to learn throughout their lives, it is clear that PR is a form of life-long education.

As education begins with children, the present study was designed to investigate if PR application could modify behavior in a primary school classroom in rural Yucatán, México. Its design was rooted in the six-year study of Castillo et al. (1997) of PR application in rural communities in which they conclude that this methodology generates new resocialization processes. For young children, who often accompany their mothers to PR meetings, it has served as a part of the socialization process as they acquire knowledge, abilities, attitudes and values that will be useful throughout their lives (Viga, Dickinson and Castillo 1995). The present study intended to test PR methodology in a formal educational (i.e. scholastic socialization) environment, ideally providing results that would allow the extension of its use into schools. Towards these ends, a PR course was designed, taught and evaluated, the results being presented in this report.

Methods and Techniques

Two groups were studied, an experimental (E) and a control (C), each with 30 children of both sexes, from eight to 14 years old, and in the 4th, 5th, and 6th grades of elementary school. The E group was in a town designated for this study as The Port, and the C group was in the town of Telchac Puerto, both coastal, rural communities in the state of Yucatán, México.

Given the lower number of children in each grade at The Port school, all individuals in these grades were included in the E group. In the Telchac Puerto school, each grade had two groups, that is, two groups of 4th graders, two groups of 5th graders, and two groups of 6th graders. In order to reduce the number of videos filmed, and achieve parity among children within a given grade group during the pre- and post-

tests, only one group from each Telchac Puerto grade was included in the study. Then, every child in the E group was matched to a counterpart in the C group of the same sex and grade.

The E group received a 40-hour-long course on PR methodology, designed and taught by two of the authors (DV and PC) in 20, two-hour sessions, twice per week, from April to June 1997. During the project period, the C group engaged in normal school activities unrelated to the present study, with no PR intervention save for pre- and post-testing. In both groups, these pre- and post-course tests were given to identify and measure cognitive variables such as PR research and participation, identification of PR stages, and the ability to prioritize activities, as well as behavioral variables such as participation frequency, type, speed and character, classroom chatting, and homework speed and completion. These variables were selected to elucidate the effects of the PR course on the E group's knowledge, attitudes, skills and values. All evaluation items were tested for clearness and accuracy before use.

The course was designed to furnish knowledge and skills basic to PR, such as the definition, basic process, characteristics, and central concepts of PR, group work, and PR application. The course was divided into four units: the first two involved explanation of concepts such as research, participation and process, as well as basic investigation steps; the third addressed the importance, advantages and benefits of teamwork; and the last addressed application of PR methodology in areas such as school, the classroom, the household, and the community. Education psychology principles such as group techniques and dynamics were applied (Woolfolk 1996) to sensitize the children to the presented themes, practice, reinforcement and concept application (Marins, Trevisan and Chanona 1988).

The curriculum was designed taking into account the sociocultural context and age of the children in the course. Sessions began with application of a group dynamic related to course content, followed by a group discussion, theme exposition by the teacher, individual or group work, and a workbook-supported integrating activity. A special workbook and didactic material were created to make the course more attractive to the children.

During the study phases, both groups were filmed on video in two-hour-long sessions in order to identify and measure changes in the children's general and group behavior in the classroom, as well as their skills and attitudes toward participation and work. The E group was filmed during the pre-test, the PR course, and post-test, and the C group only during the testing phases. Filmed aspects include the children's behavior and habitual attitudes towards their classmates and teacher, and the ways class materials and the classroom itself were used.

Using previously elaborated criteria, session films were observed and the following variables recorded: the kind (voluntary, suggested or requested), frequency, character (effusive, cheerful, discouraged, apathetic), speed, energy, and correctness of student participation; homework quantity, quality and speed; individual behavior during group work (active vs. passive); attention span; classroom chatting; attitude toward criticism; and action characteristics. Additionally, an ad hoc questionnaire was used to measure the following variables: attitudes about learning; knowledge of concepts such as research, participation, process, group, and PR; willingness to learn and to participate; and homework completion.

The measured cognitive variables address PR knowledge acquisition, PR step identification (to see, to analyze and to act), and ranking activity. Given the complexity of the PR knowledge acquisition category, it was divided into the two variables of "research" and "participation" to ease measurement. These were measured using a separate set of characteristics for each. For the "research" variable these characteristics included the following: the utility of PR in producing knowledge; that PR allows necessary investigation; that it has an established sequence; and that it is a permanent and systematic process that allows the joining of theory and practice. For the "participation" variable the characteristics were the following: that PR promotes participation; that it trains individuals and groups in problem identification and comprehension; that it engenders validation of the public's knowl-

edge; and that it constitutes a way of learning distinct from formal schooling.

Continuous variables such as knowledge of concepts like investigation, participation and PR process, as well as willingness to learn and participate, were evaluated on a standardized scale of 1 to 10. Behavioral variables such as participation frequency, type and speed were treated categorically and recorded using specific scales for each.

The behavioral variables were statistically treated using a chi-square test. A student's *t* test was applied to the continuous variables, though only after the Kolmogorov-Smirnov test was utilized to verify variable distribution normality. Only variables with normal distribution were used for this study. Finally, a paired student's *t* test was used to compare student performance in each community, and an independent sample student's *t* was used to compare the pre- and post-test results for the E and C groups.

Results

The study results show that the PR course taught in the E group significantly improved their school behavior as a whole when compared to the C group. The variables with significant post-test differences mainly relate to participation in classroom activities and homework completion as reported by the children. The most significant results for the children's PR knowledge are shown in Table 1, and those for classroom behavior categories in Table 2.

Table 1. Descriptive statistics and student's *t* test results for cognitive variables in pre-test and post-test, by group.

	EXPERIMENTAL GROUP					CONTROL GROUP				
	PRE-TEST		POST-TEST		P	PRE-TEST		POST-TEST		P
VARIABLE	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Research in PR	3.37	2.82	6.07	4.04	**	3.60	3.27	2.93	3.00	n s
Participation in PR	4.33	3.34	6.92	1.57	***	4.83	2.62	4.83	3.00	n s
Identification of PR steps	0.20	1.10	4.87	5.00	***	0.10	0.55	0.00	0.00	n s
Ordering activities skill	2.57	2.31	3.13	1.72	n s	2.13	1.74	2.37	2.16	n s

PR= Participatory Research; n.s. Not significant; **p*<0.05, ** *p*<0.01; *** *p*<0.001

Table 2. Behavioral variables, children from experimental and control groups, pre- and post-test chi-squared evaluation.

VARIABLE	PRE-TEST			POST-TEST		
	Chi ²	d f	P	Chi ²	d f	P
Frequency of participation	4.94	2	n s	19.42	4	***
Kind of participation	4.35	3	n s	12.47	3	**
Speed of participation	2.81	3	n s	19.42	2	***
Character of participation	4.02	2	n s	14.71	2	***
Chatting in the classroom	1.87	2	n s	5.41	2	n s
Fulfillment of homework	1.50	2	n s	8.33	2	*
Speed of homework	9.73	3	*	7.77	2	*

df = degrees of freedom; n.s. = non significant; **p*<0.05; ***p*<0.01; ****p*<0.001

The results suggest that the PR course was successful as the post-test showed that the E group children acquired important basic knowledge about PR methodology. Not surprising given the 40 hours of PR instruction they had received. No such change was noted for the C group, there being no increase in the understanding of these concepts between the pre- and post-tests. The E group's knowledge of PR (i.e. identification of PR characteristic 1) increased from a pre-test 3.37 (on a 1-10 scale), to a post-test 6.7, with a high significance level for the student's t test ($***=p<.001$). They had similar post-test results for PR characteristic (2), lower, but still significant, results for PR step identification (to identify, to analyze and to act), and showed no significant change in activity ordering skills. The descriptive statistics and student's t test results for the cognitive variables for PR characteristics 1 and 2 identification, identification of PR steps, and activity ordering skills are provided in Table 1.

There were no statistically significant differences in the pre-test between the E and C groups, for frequency, kind, speed, and character of classroom participation (Table 2), though there were clear differences noted after the post-test. The E group exhibited a pre- to post-test increase in high and middle participation, from 0% in both, to 6.7 and 26.7%, respectively, as well as a decline in absence of participation from 66.7% to 10%. In contrast, for the C group lack of participation decreased from 43.3% to 3.3%, low participation increased from 56.7% to 70%, and high and middle participation were not present.

Participation frequency also increased for the E group after the PR course, with 33.3% of the children placed in "regular" and "high" brackets, while the entire C group placed in the "none" and "few" participation brackets. Before the pre-test, class participation for children in both groups was mainly "obligatory or suggested" (23.4%) and "voluntary" (13.3%). After the course, speedy and glad participation increased in the E group from 16.7% to 70% and from 30% to 83.3%, respectively.

The C group children exhibited a pre- to post-test decrease in obliged participation from 90% to 50%, and an increase in suggested participation from 6.7% to 23.3%. Determination of the kind of participation for a high percentage of the C group cases (26.7%) was not possible in the post-test.

In the E group, middle speed participation decreased between pre- and post-tests from 70% to 30%, and high participation increased from 16.7% to 30%. Similar changes were noted in the C group. Differences in participation frequency and speed are highly significant ($p<0.001$), due mainly to an increase in high speed participation in the E group.

The main pre- to post-test difference in kind of participation is an increase in cheerful participation (from 30 to

83.3%) in the E group; this resulting in highly significant ($p<0.001$) post-test differences between the E and C groups.

Although the post-test evaluation difference in chatting was not statistically significant (but near the significant level $p=0.067$), the E group children were quiet more frequently (36.7% vs. 66.7%) after the post-test, a fact that suggests the course was an efficient way to increase the students' attention span.

Homework fulfillment results were unexpected in that the E group's completion of all homework fell from a pre-test 80% to a post-test 50%, while the C group experienced a slight increase, from 80 to 83.3%.

For homework completion speed as reported by the children, there were significant differences ($p<0.001$) between E and C groups in both the pre- and post-test evaluations. In the C group, half of the children reported high speed in both pre and post-tests, while in the E group only 26.7% said the same in the pre-test and 20% in the post-test. This may be interpreted as an increase in the attention and care paid by the E group children to homework.

Discussion

During the literature review, no studies similar to the present one were located; in fact, there was a conspicuous absence in the literature of reports on PR application in the classroom. The principal areas of PR application identified include: adult education (Hall 1982; Lacayo 1982; Vio Grossi 1982; Abud 1999; Pyrch 1998); popular education (Rodriguez 1982; Kantún 1995), basic education (Cabañas, Gonzalez and Zapata 1995; Cabrera, Cabrera and Mendez 1995; Burgos and Muñoz 1997; Fernández 1998; Gamboa 1998; Torres 1998; Valle 1998); community health (Rodríguez 1982); community social psychology (Castro 1993; Zambrano 1993; Almeida 1994; Argüelles 1998); productivity (Wit and Gianotten 1982; Greenwood, Gonzalez, Canton, Galparsororo, Goiricelaya, Legarreta and Salaberria 1991; Anderson and Rietbergen 1994); social promotion (Escobar 1980; Cadena 1982; Lima 1982; Schutter and Yopo 1982; Castillo, Reyes and Cortés 1994; Goncalves 1997); and child rights (Pérez 1996).

One of the merits of the present study is that it establishes an interchange between a traditional PR application, groups of adults trying to resolve diverse collective problems in an informal atmosphere, and an untraditional application, 6-12 year old children in the formal atmosphere of an elementary school. The first application aims, explicitly or not, at adult education, or resocialization, whereas the second begins or enforces basic socialization processes. Taking this interchange into account, our intent with this quasi-experimental study, rare in the traditional PR application environ-

ment, is to show how the methodology functions, what changes occur, through what means and processes they occur, and its theoretical and, above all practical, significance in this untraditional setting. This is done in an attempt to provide a better understanding of the methodology's functioning to people using PR in traditional circumstances, and thus provide tools with which to obtain better results.

The intent is also to show that PR is a life-long educational experience that can begin at ages of early socialization, that is, in elementary school. In other words, children can be socialized to use PR as a tool in resocialization processes throughout their lives, acquiring skills that allow them to be more flexible in the face of change and confront it with greater analytical ability.

The study results exhibit important changes in the E group's classroom conduct, principally in guided activity participation, and in homework speed and completion. The significance levels for variables such as PR knowledge, participation frequency, participation speed and participation character show these changes to be connected to the specific course content, techniques and procedures related to PR.

The higher participation frequency suggests greater group identification, and acceptance and attainment of the group's goals, which stimulate greater interpersonal understanding and exchange of opinion; all of which nourish the group in the long run. This interpretation is reinforced by the greater frequency in the "high" participation speed category, which suggests that the children know the methodology, like being in groups, and are motivated to act. This willingness to participate is important as it indicates motivation is individual, and depends to a lesser degree on external agents. This voluntary participation is always better than that suggested or induced.

In the kind of participation category, there was a notable decrease in discouraged participation and a complementary increase in cheerful participation. This can be interpreted as evidence that PR is capable of motivating children to participate in cheerful ways, which can be seen as a motivation, or strong reinforcement, whose effects are deeper and longer-lasting (Reynolds 1973; Cofer and Appley 1979) than the effects of weaker reinforcement might be. This is vital, as it has been shown for life-long education (Faure et al. 1983; Schmelkes 1986; Dijk and Durón 1986; Freire 1978a, 1978b; Barquera 1986), and now for PR, that motivation is a basic requirement if an individual is to attain the goal of learning throughout his/her life, and if this constant learning is to allow transformation of his/her reality.

Similar changes were expected in homework fulfillment, it being hoped that modifications in school behavior would include increases in homework speed and fulfillment. However, our results were contrary to these expectations,

with both homework speed and fulfillment decreasing. This we interpret as the E group children perceiving homework, once they had taken the PR course, as an activity lacking interest, and for which they received inadequate reinforcement from their teachers. The E group's decrease in homework speed may be explained hypothetically as an effect of the children who turned in homework dedicating more care and attention to it. However, it must be emphasized that this interpretation is speculative because even though it is based in statistically significant changes in the E group attributable to the PR course, the experiment design did not control for these two variables of school behavior as reported by the children.

Conclusions

The results reported in this study on the effects of the knowledge of PR methodology on children's classroom behavior are tentative and partial, but significant. Children participated more frequently, quickly and spontaneously, their attention span increased and classroom chatting diminished. All these characteristics improve children's learning and ease the socialization process. PR methodology also makes it fun for children to learn. This supports PR theory as it demonstrates that the use of PR methodology promotes one of the basic principles of PR theory: participation.

As shown in the post-test, changes in the children's answers about homework fulfillment indicate they were more conscious of their responsibilities. This increased conscientiousness also promotes respect for one another and allows common goals to be reached using participatory organization. This finding should be interpreted as evidence that the socialization processes promoted by PR are based mainly on the values of participation, teamwork, responsibility and caring about oneself, others, one's family, one's community and the environment in which one lives.

Some might attribute the changes reported here to the newness of our presence in the school and our way of working. However, the course was given over two and a half months, long enough for newness to wear off. A more likely explanation is that the significant changes obtained are attributable to the course itself, and not only to its novelty, as exposure of student groups to a systematic training process is known to produce changes in knowledge, skills, attitudes and values (Woolfolk 1996).

As mentioned, participation is essential to preserving, recovering, and restoring the commons (The Ecologist 1995). In particular, it is extremely important to empower children in these tasks by providing them with methodological tools, as they will be in charge of the commons in a future that will likely face even greater environmental problems.

According to our results, PR is a useful methodological tool for permanently enriching the socialization process, and could be useful in programs reinforcing high participation levels in group work. This is increasingly important as participation is relevant in the design and implementation of socioeconomic development programs for peasant communities in developing countries (Rosales 1997). Also, the socialization process is one of the main ways children learn the cultural behavioral rules and communication mechanisms necessary to fulfill the roles assigned them throughout their lives (Krotz 1984).

If human ecologists can understand and incorporate the socialization processes of several cultures, they can reinforce ecological awareness as a social impulse in the fomenting of cultural changes oriented toward more compatible relationships between society and the environment. PR methodology serves this goal as it allows the individual to understand the importance of appropriate and relevant knowledge, attitudes, and values in solving a given problem. Within human ecology, this methodology can be used to aid individuals and groups in acting to preserve natural resources and the biotic and abiotic environment. It can also initiate significant changes and increase a culture's understanding of the need for natural resources preservation, especially in populations with low education levels and poor socioeconomic conditions.

Teaching of PR methodology in the early years of life can immeasurably aid the purposes of human ecology. Once children learn it during the socialization process, it can be used outside of school in solving problems of inappropriate environmental practices and their consequences for human health and productivity. These socialization processes are closely linked to new behavior toward the environment, human well-being, and the relationship between society and nature, and therefore, to the core of human ecology.

The present study contributes to the advancement of human ecology by more deeply exploring life-long education processes. It also emphasizes the vital role participation plays in these processes by aiding in a better understanding of the conception, uses, and management of natural resources, as well as in planning for their preservation.

Endnote

1. Viga, Dickinson and Castillo are members of the Human Ecology Department, Centro de Investigación y de Estudios Avanzados del IPN, Unidad Mérida. Apdo. Postal 73 "Cordemex," 97310, Mérida, Mexico. Phones: (99)81-29-60, 81-29-20 ext. 315; Fax: (99) 81-46-70; e-mail: dviga@kin.cieamer.conacyt.mx
Canto is a student at the Facultad de Educación, Universidad Autónoma de Yucatán

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