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ABSTRACT

During the course of this pilot project, two models for environmental interactive radio instruction (IRI) were developed. The first model used a traditional IRI storyline where the setting of the radio show and the interaction over the air simulates a classroom environment. Teachers and students experimented with environmental information through imagination and practice. The second model departed from traditional IRI formats; it developed a soap opera drama which combined an entertaining storyline with environmental information and proposed action in the community. Both programs were broadcast in weekly segments for 28 weeks. This case study explored what was learned in both these experiments and why the switch to drama actually took place. Evaluation data was collected using observation guides, questionnaires, student workshops, and student focus groups. It was discovered that: (1) the serial style of presentation was effective; (2) characters were likable; (3) use of imagination was important; (4) entertainment factor made programs "special"; (5) learning was a continuous process; (6) the number of times information was presented affected comprehension; (7) local beliefs affected comprehension; (8) classroom conditions were important; (9) for some teachers, using radio was an extra burden; (10) baseline studies ensured that the production team knew how to capture children's interest; (11) quality of scripts was extremely important; (12) adults resisted environmental action, even when children were committed to change; and (13) interactivity that incorporated higher level learning was preferable. In conclusion, the experiment has shown that drama can successfully present school subject matter if the story reflects the design teams' in-depth knowledge of the target audience of children and teachers. (MAS)

ECONAUTS: MISSION NATURE

RADIO DRAMA FOR ENVIRONMENTAL EDUCATION IN COSTA RICA

LearnTech Case Study Series No. 5

by German Vargas

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Overview

The Costa Rican school system is pioneering a unique educational emphasis on a new subject— environmental education. Costa Rica is undergoing an innovative long-term process which introduces environmental education at all grade levels to begin to overcome grave environmental problems. Through education, Costa Rica hopes to promote sustainable development and preserve the survival of present and future inhabitants.

Costa Rica has experienced some success in addressing environmental and social issues in the past. The nation has a high literacy rate and one of the lowest infant mortality rates in Latin America. Costa Rica was also one of the first Latin American countries to legislate environmental protection and conservation. Today, the National Park System covers more than 12% of the nation, 20% if wildlife refuges, conservation areas, and private reserves are included. According to Boza (1992), these areas may serve as refuges for 205 species of mammals, 845 species of birds, 160 species of amphibians and 1031 species of freshwater fish, and more than 10,000 species of plants, which is more than 4% of all the plants identified in the world. This natural wealth has made Costa Rica one of the most developed countries for ecotourism.

Yet Costa Rica has also misused and mismanaged its natural resources. In 1993, 19,000 hectares of land in Costa Rica were deforested. With a significant annual population growth of 2.7%, the demand for natural resources is also increasing.

Costa Rica also holds records in environmental contamination. In 1989 Costa Rica consumed 4 times more chemical fertilizers per cultivated hectare than Canada, 9.5 times more than Honduras, and twice as much as the United States. During that year Costa Rica used 3,667,000 kilograms of active ingredient, 6.9 kg per cultivated hectare.

There is widespread contamination of rivers, oceans and coastal regions. Plants and animals are in danger of extinction. The air is dirty. Erosion, desertification and waste management are growing problems. Costa Rica's environmental problems are serious, and despite past and continuing efforts, they are getting worse.

In 1992, the LearnTech project and the Government of Costa Rica

agreed to pilot a new approach to boost awareness, increase community participation in conservation activities and teach information about the environment: educational radio. The advantages of radio in terms of breadth of audience coverage, range of programming styles and ability to build on the imaginations of its listeners are well known.

The soap opera combines an entertaining storyline, environmental information and community action.

Educational radio, especially interactive radio, has proven to be an effective instrument in teaching and learning in many subject areas including mathematics, science, second language, health and early child development around the world.

Costa Rica is well suited to radio. It has a large network of radio stations with national coverage as well as small rural stations that meet the informational needs of small populations. Radio has been used for many years in nonformal education, especially for adult literacy, agriculture and health, or for subjects of general interest.

Dur.. .. ne course of this pilot project, LearnTech developed two models for environmental interactive radio instruction (IRI). The first series uses a more traditional IRI storyline where the setting of the radio show and the interaction over the air simulates a classroom environment. A teacher and student experiment with environmental information through imagination and practice. In the second model, LearnTech departed from traditional IRI formats and developed a soap opera drama which combines a carefully crafted and entertaining storyline with environmental information

and proposed action in the community. This case study explores what was learned in both these experiments and how and why the switch to drama actually took place.

IRI for the Environment: Learning from the "Let's Listen to the Earth" Experience

LearnTech began its first experiment with environmental interactive radio instruction in Costa Rica with the *Let's Listen to the Earth* series for fourth graders. This first series highlighted three important concepts.

- Weekly broadcasts. In order for the programs to be effective, students had to listen to them at least once a week. *Let's Listen to the Earth* produced 28 half hour chapters (one for every week in the school year).

- Defined audience. The curriculum emphasized that ten year old fourth graders should think critically about the environmental situation around them, adopt changes in attitude and behavior, and become involved in community activities.

- Community participation. The programs promoted family and community participation in the activities proposed on the radio. This involved creating a 15 minute 28 chapter radio program parallel to the fourth grade programs.

The curriculum emphasized that fourth graders should think critically about the environmental situation around them.

Pre-broadcast evaluations of the programs showed that in order for family and community members to participate in activities, radio shows had to address them specifically. It was clear that the children could not establish communication and work relationships with their parents and neighbors if these people knew nothing about the environmental issues the children were learning about in school. The parallel series addressed the same issues from a community perspective. It suggested activities that the family and community could do with the children and schools. In some cases, schools listened to both series; in others, the teachers assigned children the homework of listening to the series with their parents.

Let's Listen to the Earth was well received by students and teachers. For the students, using radio in the classroom broke up the daily routine. The teachers felt that because the series followed the official curriculum, it helped them address environmental issues required by the Ministry of Education. The programs integrated content in the areas of social studies, sciences, mathematics, art and language, as well as agriculture and home economics. A teachers' manual included activities and projects the teacher could do with students in the classroom or school. The programs suggested ways for the community to get involved in the protection of national parks, coastlines, biodiversity and endangered species, as well as waste management and contamination.

Strengths of the First Environmental Education Format

Let's Listen to the Earth used a traditional method of simulating a classroom situation on the air. These elements made the series appealing:

- Radio as a means to experience the environment. In each chapter, there was at least one drama segment where student-characters of the radio show left the classroom to observe nature or do something outside of school. According to evaluators, the listening students felt that they too were outside of the classroom when they heard the program. Listening students really live the "radio fieldtrips." Beyond the entertainment value of the "fieldtrips," the most important thing for the students was learning one key thing about environmental education: school is not the only source of knowledge about environmental issues.

- Empathy in the struggle to teach. Although teachers are usually nervous and uncertain when teaching about environmental issues, they were very comfortable with the broadcasts. They identified with the radio teacher, Susana, because she didn't know everything about environmental education. Often, Susana admitted that she didn't know the answer and asked the radio students to investigate with her. This was key to gaining the confidence of the listening teachers as they learned complicated subject matter alongside the radio teacher. If the radio teacher had "known a lot" about the environment, the listening teachers might have felt "inferior" to the radio teacher.

- Student participation and interactivity. *Let's Listen to the Earth* proved that interactive methodology is valuable. By dividing content into segments and having students actively participate through interaction with the radio characters, the information and content presented was more exciting and memorable.

There were questions about the value of some of the types of interaction promoted. Traditional interactivity where a character, usually an adult, asked questions of the children replicated authoritarian classroom hierarchies. This type of interaction did not help the children associate the content with their own experiences with nature, and probably did not encourage them to come to their own conclusions and make their own recommendations on what to do about environmental problems. The fact that students answered the radio characters "correctly" did not necessarily mean that they were learning or applying their knowledge.

Classroom teachers learned the complicated subject matter alongside the radio teacher.

Let's Listen to the Earth worked well with fourth graders and was a step in the right direction for environmental education in Costa Rica. The series supported the students and teachers, who had very few materials on environmental issues. However, when it came time to continue the experience with fifth grade children, the production team decided to look carefully at the format and make needed adjustments.

Are Fourth and Fifth Graders Very Different?

The production team planned to continue with the theoretical framework and interactive methodology that had been successful in the fourth grade series, but asked themselves a simple question: how different are fourth and fifth grade radio audiences? Are they similar enough that the same radio format can be used? How should the new radio series cater to the new audience?

It was agreed that adults should not simply guess the interests and desires of young people. Instead, a survey was designed for fifth graders from diverse geographic and social sectors. The team identified certain trends that dramatically affected the design of the radio series:

Children in fifth grade tended not to accept adult explanations as the absolute truth. There was a marked difference in the critical attitudes of fourth and fifth graders toward adult explanations of events in nature, society, economics or other spheres. In general, fourth grade children accepted adult explanations more easily while fifth graders had a strong tendency to create "their own explanations." For the production team this meant that the fifth grade series could not present information as a "finished product" but should encourage children to come to their own conclusions. This finding greatly influenced the decision to reject traditional educational radio formats.

Children in the fifth grade didn't believe in magic solutions. Although the fifth grade audience enjoyed fantasy, legends, epics, and adventure plots, they rejected "magic solutions." They considered fairies and magic wands "childish." For these students, problems or phenomena should have a logical, rational, and scientific explanation. They showed a marked increase in interest in natural sciences and the laws that govern natural phenomena.

Love towards humans, animals and nature was a recurring, omnipresent theme. In general, the audience surveyed enjoyed plots dealing with love of humans and nature. However, the relationship between humans and the natural environment was viewed differently by children from rural and urban areas. Urban children showed a strong tendency to describe the natural environment as places where one went to rest, recreation spaces. Rural children, on the other hand, saw the environment more as a home, a place that provides work and food. They saw nature as a "provider of natural resources."

Children knew about environmental problems, but not about solutions. The team could not accurately determine the sources of information, but it was clear that these children, unlike the fourth graders, knew a lot about environmental problems and were genuinely concerned. However, evaluators noticed that the children had serious difficulties trying to offer solutions to the problems. There was an overall tendency to propose a solution simply as the opposite of the problem; the answer to contamination in the rivers was to "not contaminate the rivers," and the answer to deforestation was to "not cut down trees." The programs would have to create situations in which there were many options for solutions to discuss and analyze.

The "bad guy" is a crucial character. Fifth grade children did not fear the "bad guys." Instead, they were interested, almost fascinated, by the bad guys. Fifth graders were not interested in the bad things these characters did, as much as the reason they acted bad. This surprising finding influenced how characters and conflicts within the series were created.

The children had an apocalyptic vision of their future. The evaluation revealed that children had a very pessimistic, almost desperate, vision of their future. Both urban and rural children felt powerless to change the current national and global environmental situation.

Fifth grade children needed new learning environments. The students were tired of the daily dynamics within the classroom. They were searching for new voices, interesting challenges, and new sources of information and ideas. This called for expanding their learning environment, not reducing their education to school and the classroom.

Based on these and other conclusions, it was clear that the focus and format of the fourth grade series, a teacher in a classroom and a small, fairly rural town, was not ideal for this new audience. LearnTech and the Costa Rican production team decided to create an innovative drama for environmental radio education.

Stimulating Learning Through Drama

The first challenge was to create an njoyable and interesting storyline that facilitated teaching the Ministry of Education curriculum on environmental education. This created a conflict between the communicators and artists and the teachers and curriculum specialists. The question was always, 'if drama is used, will it simply be a pretext for introducing the curriculum content or will the story be as important as the content?'

Fifth graders were searching for new voices and interesting challenges.

In Costa Rica and other Latin American countries, there has been a kind of prejudice against drama and soap opera because they are associated with entertainment. Enjoyment is not seen as educational. In general, educational radio tended not to use drama as a resource in and of itself. This perspective was reflected in the poor quality of writing and acting in those educational programs which did use drama.

Good Writing Skills

In the *Econauts* series, the production team emphasized these three elements of good writing:

Believability. People prefer stories that are presented in a believable way, even if the actual plot is impossible in the real world. When the story was not believable to the children, they lost interest. In response to the audience research, the production team worked at creating a believable science fiction story. This was a challenging task given the subject matter and the objectives of the project.

Conflict. Conflict is the basis for any story or plot. However, the team discovered that the teachers wanted to avoid conflict because they did not consider it "educational." The production team had to work hard to reconcile these positions by looking for conflict at all levels-- from physical to psychological conflicts among humans, or between humans and invisible forces of destiny, to conflicts between humans and the forces of nature, in this case, the conflict between developing or conserving natural resources.

Structure. The production team also had to create a climactic structure in which each lesson had its own dramatic form with a beginning and an end, while still leading the story toward a final climax in the last chapter. This forced them to study, plan and practice ways to sustain an audience's interest by using suspense while presenting the content in an effective way.

Using content taken from the official curriculum, three stories with conflict and suspense, a group of appealing and provocative characters, and a series of interesting settings, *Econauts: Mission Nature* was created.

Econauts: Mission Nature

The series *Econauts: Mission Nature* consists of 28 radio programs, or chapters, broadcast to fifth grade classrooms once a week. The project also broadcasts a second series of 28 chapters called *Puerto Ventura: The Ecological Struggle*. Although the content of the two series is similar, *Puerta Ventura* is designed for parents and community members as well as children.

The series has three general objectives:

- To support teachers in the classroom, but not to try and replace them. The Ministry of Education introduced environmental education concepts without having trained teachers or prepared classroom materials suitable for the subject. The radio programs are a resource for teachers who have little expertise and few other materials to draw upon.

- To promote environmental ethics in children, parents and community members. They should be aware of issues, and change attitudes and practices that are harmful to the environment. The team believes that the only way to reverse the process of environmental destruction is to encourage individuals to take responsibility for their own actions.

- To encourage students, teachers, parents and community members to protect the environment. Environmental education must promote action and not just the accumulation of knowledge. The programs offer time for discussion and suggest ways to apply environmental knowledge within the community.

To meet the three objectives, *Econauts* uses a weekly serial drama or radio soap opera to teach the knowledge, attitudes and values outlined in the Ministry of Public Education lesson plans.

Multi-dimensional Characters

In traditional education there is a tendency to present simple characters who are too rigid and one dimensional, discouraging the child from identifying with the characters on a personal level or critically analyzing the information they present. The structure and length of the *Econauts* story allowed the creation of complex characters who could develop, grow and change throughout the story. The team tried to avoid stereotypes and gender biases; for example, the female protagonists are intelligent and adventuresome, and enjoy physics and mathematics.

The *Econauts* team tried to create realistic personalities that developed and changed as the characters react to conflict. Since the baseline study revealed that children in the fifth grade were

attracted to the bad characters, a lot of time was spent developing Tanatos. Tanatos is a tempter, an intelligent and wise character whose arguments for evil are difficult to combat. He can only work evil through humans. This identification with humans provides dramatic complexity and an opportunity for critical thinking.

The Story

Econauts is a love story between Captain Von Bios and Princess Cassandra, who can predict the future. They guard the Arc of Wisdom, a collection of precious objects that maintain balance among the natural elements allowing humans and nature to live in harmony. Cassandra and Von Bios are united by the sacred mission to protect the Arc from Tanatos. Evil, greedy Tanatos disrupts the natural harmony with his desire for progress at any cost. One day, despite Cassandra's warnings, Von Bios carelessly allows Tanatos to steal the Arc and hide each of the elements it contains in the most remote areas of the planet. From that moment on, the balance between humans and nature is lost, causing environmental disaster. Von Bios is punished. He cannot be reunited with Cassandra until he recovers all of the elements of the Arc. Von Bios battles Tanatos, who takes advantage of human ignorance and greed to make sure that environmental balance is not restored. Disillusioned and tired, Von Bios retires to his cave leaving Tanatos free to wreak destruction.

In the "real world" suburban town within the story, a group of young fifth graders form a club. They claim an abandoned lot near the river and build a clubhouse in one of the trees as their play and study space. The club members are Simon, Omar, Anibal, Sofia and Silvia. Simon is the leader. His loyal friend Omar is a chubby, studious boy who loves to read. Anibal is the physically strongest of the group. Strong-willed and intelligent, Sofia is a born detective. She represents creative scientific thinking. Silvia works after school and has trouble with her schoolwork, but is loyal to the club. Two characters were added later: Kim, Omar's younger brother, and his dog Fleas.

Omar, in one of his many visits to the school library, finds an old mysterious book written in a strange language with drawings of a treehouse. One illustration shows a strange map with symbols and then a picture of the treehouse demolished. The children believe that the book tells their story and they adopt it as the club's secret book. One day, Silvia tells the group that according to her father, a city government worker, there are plans to cut down the trees in the

club's lot to build a warehouse and parking lot for the city. This news spurs the children to action. They form the Econauts by swearing an oath to defend and protect their treehouse and the little woods around it. Cassandra helps the children by guiding them to Von Bios' cave. After turning them down several times, Von Bios finally agrees to join the Econauts in their fight to save the treehouse and resume his mission to recover the Arc of Wisdom.

The *Econauts* series has three parallel plots:

- *The love story* between Cassandra and Von Bios and the battle against Tanatos to recover the Arc of Wisdom and environmental balance;
- *The adventures* of the Econaut club and their heroic fight to save the treehouse and the woods, and to help Von Bios;
- *The conflict* between sustainable development and other forms of "progress" that promote environmental destruction.

These three elements unfold simultaneously throughout the 28 chapters.

The Dramatic Settings: Setting the Stage for Learning

The creators of the series had to invent a wide range of settings and interesting dramatic situations to facilitate the fluid presentation and development of the content.

A butterfly ship to travel in time and space. Understanding environmental problems requires a global, integrated vision in where the cause and effect of actions are explored. To elaborate these principles, the Econauts characters travelled in time and space to show the listeners certain ecosystems in other times and places, how things had changed and the causes and consequences. "Vital," Captain Von Bios' special spaceship, could travel through time at incredible speeds. It could be called telepathically and recognize the voices of the children listening in the classrooms.

A laboratory and library-museum in which to experiment. The content required the characters to visualize experiments over the radio. To facilitate the transmission of these experiments, Von Bios

had a laboratory in his cave where the Econauts could conduct a wide range of scientific experiments using a sort of robot or "knowledge machine" built by the Captain. There was also a large library-museum with a collection of books and historical material, a genetic bank of seeds and eggs, and specimens of extinct or endangered animals and plants.

A garden in which to practice environmental theory. The contamination of water sources is a central theme in the curriculum, so the design team created a river in the abandoned lot with the treehouse. The river was contaminated by the people who lived around it, including the families of the Econauts. The lot and the garden were settings that allowed us to address contamination, garbage, crops, erosion, burning and soil use.

The school is a useful setting, but you have to put a bit of magic in it. The Econauts are all primary school students and the school setting could not be ignored. The design team tried to overcome negative associations with the school by making it a place where even storage areas and abandoned rooms lead to adventure and action.

Adjusting to Structural and Financial Constraints

The *Econauts* design and production team worked together differently in a unique manner. In the process of designing the dramatic and curricular content, they saw that the traditional way of producing radio shows within the Ministry of Education was not very participatory. For example, usually there exists little or no communication between those responsible for content and the scriptwriters. They had to create a way for curriculum experts, scriptwriters, technicians and artists to work as a team, sharing each step in the design process. So they put together a solid production team and slowly incorporated teachers/curriculum experts, communications specialists, actors, musicians, scriptwriters and other people who brought their ideas and creativity. Group cohesion was possible because there was never a rigid hierarchy or a repressive system to ensure that everyone did their job. Instead, the system encouraged solidarity, friendship and positive reinforcement.

The small budget forced the team to make further changes in the usual process of producing radio programs. They recruited and trained volunteer boys and girls to act in the series. The few professional actors hired worked not only as actors, but also as teachers and guides for the child actors.

They also began recording with only six finished scripts. While usually a disadvantage, for the *Econauts* it became an advantage. As the story developed the writers went to the studio, saw the recording process, spoke with the actors, and adjusted their scripts. In turn, the actors could express their own ideas about the characters they played, and make recommendations about how to bring out character traits and advance the storyline.

The project did not have funds to rent studio space. A cooperative agreement with the Interamerican Institute for Agricultural Cooperation facilitated the use of a studio one day a week. With such little studio time, the team had to develop an efficient recording process. They recorded two programs (*Econauts: Mission Nature* and *Puerto Ventura: Ecological Struggle*), edited, added sound effects, and made a master tape of the programs, all in the same day

The more complex nature of problem solving needed to be reflected in the radio programs.

Time limitations forced the team to design a system of reading, interpreting and rehearsing the scripts beforehand so that they could begin recording as soon as they arrived at the studio. They also had to perfect "live" sound effects since it was difficult to insert pre-recorded sound effects during the sound editing.

Asking Open Questions and Stimulating Thinking

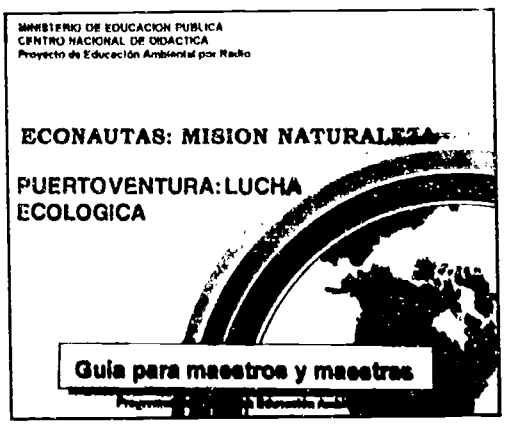
In environmental education, unlike other subjects like mathematics, language or even natural sciences, there is no single answer to the causes, effects, and solutions to most problems. A combination of factors contribute to environmental problems and in many cases,

the answers are not yet known. The more complex nature of problem solving needed to be reflected in the radio programs. The *Econauts* series, therefore, explored new kinds of interactivity, going beyond the automatic responses to a question where a child might not answer what he or she thinks, but what the teacher expects. They introduced open questions with many "correct" answers. They also defined interactivity and learning not just as verbal responses or physical actions, but also as concentration, attention and thinking during the stories. These important forms of interaction led to high levels of "learning."

Providing Support for Teachers

The production team designed, edited and published a guide that includes a synopsis of the programs, up-to-date information about the subjects covered in the broadcasts, and creative ideas for practicing the environmental solutions discussed in each chapter. Although the teachers' guide was important for disseminating information, systematic training of teachers was also necessary to guarantee that the programs were used in the intended way and curricular objectives of attitude and behavior change were understood.

For example, one of the most valuable resources in drama, talking about the story, was not always well-used because some teachers did not know how to lead the discussions. Other teachers tried to impose their viewpoint upon the children, sometimes stereotyping or oversimplifying environmental problems, and undervaluing class participation. Favoritism and gender biases were also evident. Sometimes teachers favored certain children by always calling on them, or calling on more boys than girls.



The teachers' guide includes creative ideas for environmental solutions.

Results and Conclusions of the Final Evaluation

To assess the success of the *Econauts: Mission Nature* and the use of drama for IRI, a final evaluation was conducted. This summary outlines only a few of the conclusions and recommendations of the final evaluation of the fifth grade programs. The full evaluation report is available from the LearnTech project.

Objectives

The purpose of the evaluation was to see how the series worked in the classroom, if the drama-adventure format was entertaining, and if the boys and girls understood the story and content in each chapter. The objectives of the evaluation were to:

- Understand how the program worked with fifth grade audiences through:
  - a. Exploring how much, what and how well the students understood the stories and content
  - b. Knowing the characters and dramatic situations that most interested the students
  - c. Knowing how interactivity works within the dramatic model
- Understand how the teachers used the programs before, during and after broadcasts.
- Understand how the programs related to mobilization efforts in favor of the environment.

Methodology

The evaluation team selected 10 chapters from *Econauts* and 10 from *Puerta Ventura* for participating teachers and students to get a feel for the whole series. The team felt that geographic and socio-economic factors were important variables, so they chose 5 schools representative of the 5 most important socio-economic and environmental areas in Costa Rica— banana plantations, rural farms, middle class urban areas, marginal urban areas, and coastal tourist areas.

Collecting data and results from boys and girls with different experiences and lifestyles was an important aspect of the

evaluation, not for statistical representation, but as a reminder that the programs reach children and teachers with different life experiences that determine how they use and perceive the programs.

Each school was assigned one evaluator. Each evaluator gave participating teachers a work guide and set up the listening schedule with them. They listened to two programs a week, one from each series. Giving the teachers the programs on cassette tapes allowed them to coordinate the listening times around the class schedule. Participating teachers had no previous experience using the series, except one teacher who had used the fourth grade series. They were not given any special help, except general information about the project.

A Variety of Evaluation Techniques

The evaluation team recognized that each evaluator comes into the classroom with a preconceived idea about what it means to pay attention and behaviors that indicate interest and comprehension levels. They found high levels of comprehension in children who moved around, played with things, or didn't seem interested in what they were hearing. In fact, the story was received differently by each listener depending on his or her personality, perceptiveness and life experiences. People also have different means of expressing what they understand and identifying what is important. Therefore, evaluators should not impose an adult's point of view nor come in with preconceived notions, but try to have an open mind. Only then can one discover the incredible challenges and multiple shades of meaning in dramatic educational radio.

Volunteer children were recruited and trained to act in the series.

Qualitative evaluation tools were chosen. Traditional observation techniques were crossed with other testing methods which would capture opinions and knowledge from students and teachers in a diversity of ways, such as drawings or roleplaying stories. As a result, sometimes children who seemed passive or distracted during the broadcasts were later able to perfectly reconstruct and represent the sequence of the story. Other children who gave vague answers on the questionnaire, seemingly indicating a low understanding, later drew pictures which clearly captured the content of the programs. Finally, children's letters were revealing. They wrote about the characters' personalities, imagined what the characters looked like and described the settings.

Evaluation Tools

- *Observation guides* to record what happened before, during and after the listening session. The team commented on whether children seemed to understand the subject and how the teachers used the programs.

- *Multiple choice questionnaires* given to the children after each radio program to measure the level of comprehension of the story and the contents.

- *Workshops* in which the children expressed themselves by acting out, drawing or writing letters to the characters.

- *Five person peer focus groups*, a specific technique in which 5 boys and girls listened to one program. They were free to stop the cassette at any moment to discuss or comment on something, or rewind the tape and relisten to parts. This technique, suggested by Klaus Galda, gave the evaluators greater insight into the students' reactions and their areas of interest.

Conclusions

1) The serial style was effective. Every listening session covered one episode of a larger story that was developing. The fact that the students, and the teacher, got to know the story little by little was perceived as a motivating factor.

2) The characters were likable. The main characters and songs reinforced the image of the boys and girls in the classroom as protagonists discovering things about the environment and protecting it.

3) The use of imagination was important. As in the *Let's Listen to the Earth* series, each adventure was a way to leave the walls of the classroom behind through imagination.

4) The entertainment factor made the programs "special." The dramatic format broke with traditional teaching methods and the children considered the program a special activity. The entertainment value was seen as the key to their acceptance.

5) Learning was a continuous process. Understanding the story and the content is a process by which the students become familiar with the story, the characters and the subject matter. The students must learn how to listen to the radio, as they are not used to having a radio in the classroom.

The learning process was reflected in the students' listening comprehension level. As students listened to more programs they got better at understanding the story, recognizing the characters, and managing the content. The evaluation showed that children who listen to the program regularly and continuously learn and make better use of the content. Teachers who cancelled, changed, postponed the program, were sick or interrupted the sequence of the sessions had students who sometimes did not remember or identify certain characters.

6) The number of times information was presented affected comprehension. Almost all of the students correctly answered the questions relating to the sequence of the story, as well as questions and drawings about the main environmental content of the story. However, comprehension levels dropped for more specific or complementary content, especially if it was derived from the main message and appeared only once in the episode.

7) Local beliefs affected comprehension. Comprehension levels also dropped when a program dealt with content which directly contradicted established beliefs in Costa Rican culture. For example, the children would correctly answer the questions related to how useful snakes are (in the banana growing region), but then explain how, in their daily lives, they fear snakes and kill them.

8) Conditions in the classroom were important. Less than optimal listening conditions were an obstacle for the children in listening to and understanding the programs. Many Costa Rican classrooms only have one electrical outlet, often in bad condition. This forced teachers to waste time and disrupt the class by looking for another space to use and repositioning the students. The students had to sit around the electrical outlet to hear the radio. Sometimes the cable came in from a window or a wall plastered with posters which distracted the students. Interruptions were common in many classrooms. Janitors, parents, and fellow teachers all came into the classrooms regularly looking for the teacher and disrupting the listening students and learning process.

9) For some teachers, using radio was an extra burden. Teachers were sometimes reluctant to use the radio because they saw it as extra work. The evaluation included listening to two programs per week, one in each series. The optimal teacher preparation of listening to the program before playing it in class and planning how to use the program seemed to be too demanding. In some cases teachers listened to the program without even having read the teacher's manual.

Children enjoyed introducing ideas or actions into the story.

In addition, the radios or tape players were often problematic. Either the tape players were small and had bad sound quality, or the teacher didn't know how to set the volume or tune the radio. Some teachers, on the other hand, were very enthusiastic and incorporated the programs into their own teaching styles. They summarized or reconstructed the episode before or after the broadcast (marginal urban area and sometimes middle class urban area). The children found this task easy and seemed to enjoy reviewing what they had heard together.

These findings implied that while the programs were exciting and useful for some teachers, the assumption could not be made that all teachers made good use of the programs.

10) Baseline studies ensured that the production team knew how to capture the children's interest. Evaluators found that knowing the audience well through direct contact was the key to ensuring that the drama captured the children's interest.

11) Quality of the scripts was extremely important. The key elements of a successful dramatic script are the dramatic build up of the conflict, the development and the climax. The evaluation showed that an appealing story with a well developed conflict facilitated the teaching of educational content.

12) Adults resisted action, even when children were committed to change. Although children were motivated to act, they met with obstacles when they tried to take concrete action in the school or community. For example, the children in the coastal community of Riojalandia looked for sources of contamination. They planned to dig a big hole in the school to bury garbage as a solution to the problem of waste management. The children in another marginal urban area campaigned to recycle aluminum beer cans and use the proceeds to paint the classrooms. They also proposed planting a garden, a compost pile for leftover food, and a science fair. In a urban middle class area, the children suggested planting trees and a garden. In each case, the suggestions met with resistance from adults, especially school principles, who felt they did not authorize the actions. Uninspired teachers simply see the children's ideas as more work. According to some administrators "the solutions should come from the government."

This experience suggests that it is important to work with administrators in educational centers to encourage them to allow and value grassroots and child participation in school and community action.

13) Interactivity that incorporated higher level learning was preferable. *Econauts* showed that the best interactivity for environmental education involved ways to encourage the students to follow the story. In the drawings, letters, dramatizations and observations, the children showed a great capacity for imagination and thinking. The team experimented with different forms of interaction because each child reacts differently. Sometimes, the

characters asked the children to answer questions, offer opinions, or intervene in the story with ideas or actions. The children especially enjoyed this form interactivity because they had a role in the development of the action. Putting the reins in the children's hands by letting them stop and start the cassette tape also diversified interaction. Evaluators found that the children could anticipate events in the story, comment on them, refer to things that happened in their own lives, etc,.

A Final Word

Costa Rica's experience has proven that drama can successfully present school subject matter if the story reflects the design team's in-depth knowledge of the target audience of children or teachers. It is also important not to treat the dramatic story as simply a pretext for the content, but rather a source of information and a story with entertainment value of its own. When the story and content are treated as an indivisible whole, the children construct knowledge by living and feeling the story, without feeling as though they were in a classroom.

The Costa Rican production team has introduced drama as an innovative educational radio format, but there are still many facets open for experimentation. Hopefully, this experience will spark others to explore the myriad possibilities of dramatic educational radio.