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A PILOT PROJECT IN SATELLITE COMMUNICATION
FOR EDUCATION IN BRAZIL

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ABSTRACT

In this paper a brief discussion of the experiment that was undertaken in Brazil to show the feasibility of using a technological system for education in national scale based on a communication satellite is presented.

The Brazilian Educational system can hardly cope with its task as a national development promotion agent, due to the problems that it has to face.

The lack of teachers with a degree, their slow formation, the impossibility of reaching all parts of the country with the same teaching quality, the great contingent of children that are not served by the system - from the age of 7 to 14 education is compulsory - are problems that have worried the educational authorities.

An alternative that has been under study for more than ten years - and is practicable mainly due to the continental extension and the lack of resources of the country - is the use of communication satellites in education.

The Instituto de Pesquisas Espaciais (INPE) - the Brazilian Institute for Space Research - conscious of these problems and with the intention of participating in the process of national development, engaged in the SACI Project (the initials stand for Advanced System of Interdisciplinary Communications), which had the *aim* of demonstrating the feasibility of using a technological system for education in national scale, based on a communication satellite.

In 1968, INPE started the studies of this possibility through the implementation of the SACI Project, constituted by three segments.

On *Segment 01* voice linkages were made between INPE and Stanford University, through NASA's ATS-3 satellite. This allowed preliminary studies of the use of a geostationary artificial satellite as a means of distributing Radio and TV signals, showing its potential for educational purposes.

On *Segment 02* a Pilot Project - the Educational Experiment for Rio Grande do Norte State (EXERN) - was developed for the proposed

national education system (Figure 1). This project involved the development and testing of instructional material and the operation, evaluation and administration of a system of Educational Technology, showing the feasibility of this project within Brazilian reality.

On *Segment 03* the feasibility of using a domestic communication satellite for the Brazilian educational system was studied. The results showed that it was practicable, mainly for the less educationally assisted populations living in isolated regions with limited resources.

A prototype of a low-cost receiving station was developed, which could later be manufactured by the Brazilian industry.

Since it would be impractical to conduct the experiment over the whole Brazil territory, the state of Rio Grande do Norte in the Northeast region was also chosen for Segment 03 of SACI Project.

Therefore, the EXERN experiment was originated from the necessity of testing - in a small but representative scale - the utilization of a system with Educational Technology in the solution of the problems of quality and quantity of the demand for education in the area. The space segment for this experiment would use NASA's ATS-F satellite.

The general aims of the experiment were:

- 1) Study, in partially controlled conditions, the efficiency of an apprenticeship programme through Radio, TV and Printed Material.
- 2) Develop educational TV and Radio programme techniques for several formal levels.
- 3) Based on a formative evaluation, improve or create programme improving conditions so as to fit them to the user's necessities.



Fig. 1 - Rio Grande do Norte State location

- 4) Verify the acceptance degree of the use of new technologies in the formal education system.
- 5) Test approach techniques to obtain support and contribution from the communities for the realization of the experiment.
- 6) Offer better educational conditions to a considerable part of the school age population in the areas of the experiment.
- 7) Develop and test methods and routines for the installation, operation, and maintenance of a ground equipment in the experiment and for the operation of the logistics and supervision networks.
- 8) Test the use of the artificial satellite as a signal-distribution element in a tele-education system.
- 9) Analyse the results in terms of cost/effectiveness and cost/benefit ratios, comparing them to the current data of the traditional system.
- 10) Prepare personnel for project planning, control, material development, evaluation, and operation in the field of educational technology.

Existing school installations, mass-communication resources (Television, Radio, Printed Material, Satellite), existing human resources, and an adequate logistics infrastructure were considered when defining the system, taking into account the Brazilian reality.

Starting from these conditions, the users were defined: teachers without degrees and students in the four first years of formal study.

Supervisors and teachers were trained for the functional integration of the system.

Not only teachers but also students had classes through Radio and Television. The teachers received class monitoring material and were oriented, through a teacher's guide book, on how to give assistance to the students.

With the users and the system configuration defined, and with a multimedia approach for the classes, the method was gradually set up by eight Missions (Table 1), to serve 500 schools, distributed through 71 municipalities in Rio Grande do Norte. The odd-numbered Missions were for the teachers and the even-numbered ones for the students.

TABLE 1
EIGHT MISSIONS PROPOSED FOR THE EXERN

MISSIONS	POPULATION	DESCRIPTION OF THE MISSION
I	Teachers	1. Teacher and supervisor training 2. Capacitation course for non-titled teachers in the level of primary school (4 years)
II	Students	1. Contents of the first year of primary school (TV) 2. Contents of the second year of primary school (Radio)
III	Teachers	1. Teacher and supervisor training 2. Capacitation course for non-titled teachers in the level of junior secondary school (4 years)
IV	Students	1. Contents of the first and second year of primary school (TV) 2. Contents of the second and third years of primary school (Radio)
V	Teachers	1. Teacher and supervisor training 2. Capacitation course for non-titled teachers in the level senior secondary school (3 years)
VI	Students	1. Contents of first, second and third years of primary school (TV) 2. Contents of the second, third and fourth years of primary school (Radio)
VII	Teachers	1. Teacher and supervisor training 2. Updating course for teachers at the level of primary school (4 years)
VIII	Students	1. Contents of the four years of primary school (TV and Radio)

From the eight initially planned Missions, only four were executed: Mission I in 1973, which served 1,105 teachers; Mission II, also in 1973, which served 13,464 students, and, in 1974, Missions III and IV, which served, respectively, 1,326 teachers and 11,583 students.

The users served by the Experiment are presented in Table 2.

TABLE 2

USERS OF EXERN UP TO 1974

YEAR	Nº OF TEACHERS	Nº OF STUDENTS
1973	1,105	1 st year 9,137
		2 nd year 4,327
		TOTAL 13,464
1974	1,326	1 st year 6,152
		3 rd year 1,629
		TOTAL 11,583
TOTAL AMOUNT	2,431	25,047

Some problems canceled out the realization of the remaining Missions:

- 1) A cut in the 1974 budget for SACI Project, which permitted the production of Missions III and IV but prevented the planning and production of Missions V and III;

- 2) difficulties in obtaining funds for the SACI Project in 1975, thus cancelling the planning of the remaining Missions.

The Pilot Project basically had the participation of pedagogues, psychologists, sociologists and communicators - all specialized in Educational Technology - and also engineers, systems managers and support staff, all of them working at INPE Headquarters in São José dos Campos, São Paulo State. On the other hand, the logistic support staff and the teachers from the State Education Department worked at INPE installations in Natal, Rio Grande do Norte.

The production of the group in charge of the planning, production and evaluation of the instructional material in each Mission was the following:

- Mission I 488 fifteen-minute Radio and Television programmes plus Accompanying Printed Material.
- Mission II 150 fifteen-minute Television programmes plus Teacher's Guide.
- Mission III 63 fifteen-minute Pedagogical Orientation programmes for Radio and Television.
- Mission IV 150 fifteen-minute Television programmes, 150 fifteen-minute Radio programmes, plus Teacher's Guide.

The class production activities for the Missions stopped in August 1974, when the production of Missions III and IV ended.

The formal proposal for the use of the satellite was presented in 1969 and reformulated in 1970, by a request from NASA, which intended to launch a ATS-F satellite in 1972. However, as this launching was postponed to 1974, it was decided that the EXERN Experiment would

begin with terrestrial transmitters, without using the satellite, so as to test the validity of the so far educational methodology developed. For this purpose, three TV stations were installed in Rio Grande do Norte and three local radio stations were also used. (Figure 2)

Finally, after the ATS-6 satellite was launched on May 30, 1974, NASA put it at INPE's disposal for 30 minutes every day, from December 1974 to May 1975, corresponding to two daily lessons, each one lasting 15 minutes. The experiment had been already operating by terrestrial means for two years.

The system operationalization via satellite encountered many difficulties, caused both by the importation of equipment and problems related to the antenna pointing and interferences; this reduced the time available for retransmissions. As a consequence, the educational transmissions via satellite took place, successfully, only in April and May, 1975. During this period, ATS-6 received the signals transmitted directly from INPE Headquarters in São José dos Campos, and retransmitted them to a receiver in Natal, which supplied the local TV station, which finally retransmitted the signals to TV sets installed in the schools involved in the experiment.

The Overall Evaluation of the Experiment began August, 1974 and had two purposes: one of "additive" nature, based on the two years of experiment operation, and through which one could verify if the project objectives were reached; and another of "formative" nature, where one could identify difficulties and problems founded during the system's implementation, in order to offer subsidies for a future utilization of EXERN by other agencies, or for its eventual expansion to a national ambit. Operationally, the evaluation was divided into two parts:

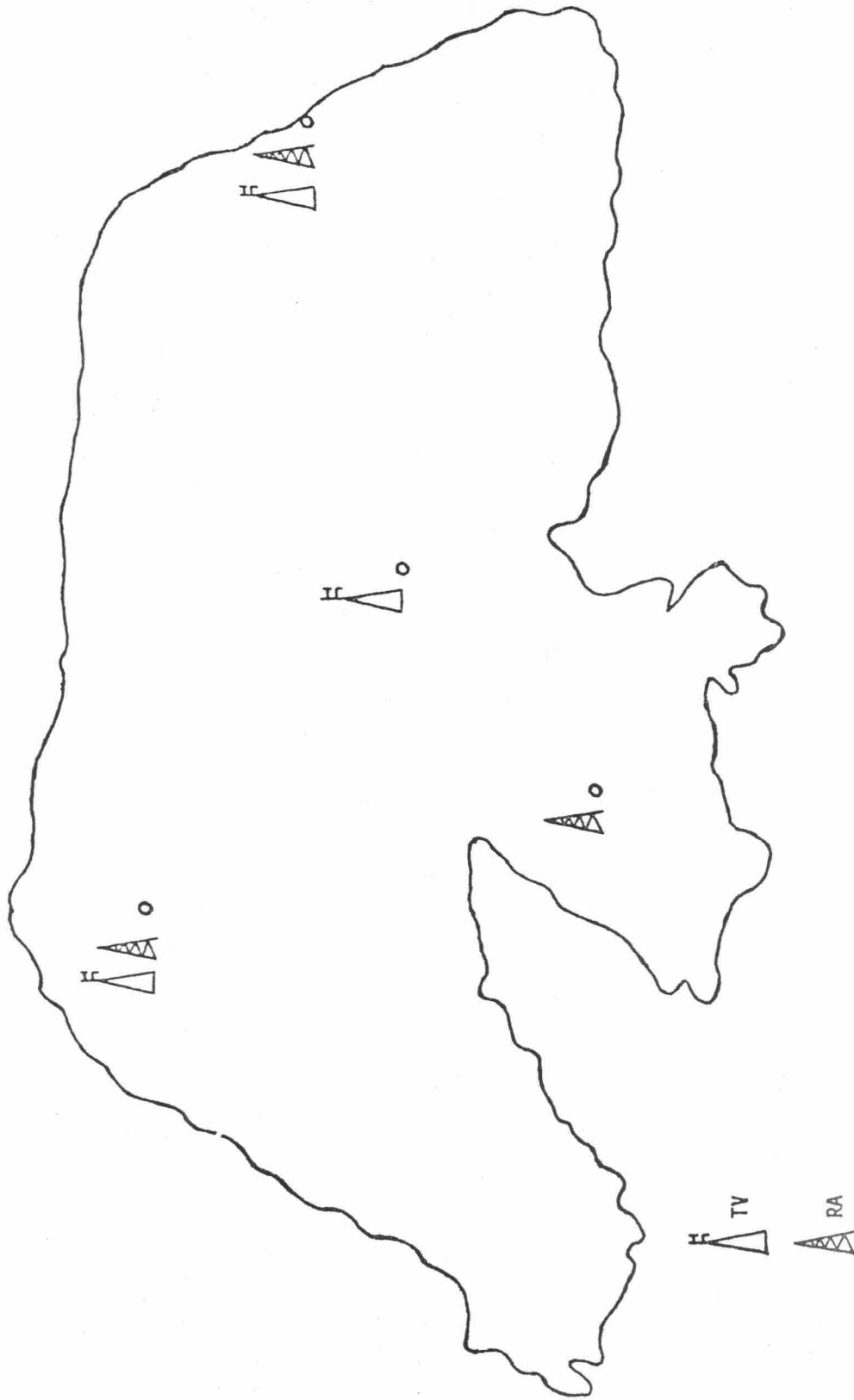


Fig. 2 - TV and Radio Network used in the EXERN

1) Evaluation of the system implementation effects:

- . Educational Evaluation
- . Evaluation of the psychosocial impact of the Project
- . Cost/Effectiveness Evaluation

2) Evaluation of the system implementation processes:

- . Evaluation of administrative aspects
- . Evaluation of operational aspects
- . Analysis and elaboration of instructional materials.

For this accomplishment, evaluation studies relating to each objective were made (Table 3).

Though not all studies have been concluded due to the disactivation of the Pilot Project, results already obtained on the educational evaluation, the cost/effectiveness evaluation, the training of personnel, and the utilization of the communication satellite were considered positive. Besides, contacts with the local community and teachers showed to the evaluation team the validity of the Project.

Moreover, in order to transfer the Educational System of EXERN to the State of Rio Grande do Norte a special training in Natal was planned and performed which had as a objective to form a team, capable of planning, producing, performing and evaluating instructional materials for a Tele-education System in that State.

INPE's participation in the SACI Project finished in the beginning of 1978, when the Project was transferred to the Federal University of Rio Grande do Norte (Universidade Federal do Rio Grande do Norte) and Education Secretary of Rio Grande do Norte (Secretaria da Educação do Rio Grande do Norte); this transference included all related equipment, including a complete Education TV Network.

TABLE 3

OBJECTIVES, EVALUATION STUDIES AND VARIABLES INVOLVED

	KINDS OF STUDY	VARIABLES INVOLVED
1. Study, in partially controlled conditions, the efficiency of an apprenticeship programme through Radio, TV and Printed Material.	Educational Evaluation	Educational
2. Develop educational TV and Radio programme techniques for several formal levels.	Elaboration Analysis of the Instructional Material	Educational
3. Based on a formative evaluation, improve or create programme improving conditions so as to fit them to the users' necessities.	Elaboration analysis of the Instructional Material Analysis of the Programmes Formats	Educational
4. Verify the acceptance degree of the use of new technologies in the formal education system	Educational Impact of the Project	Psychosocial
5. Test approach techniques to obtain support and contribution from the communities for the realization of the experiment	SACI Interface Administrative Aspects	Psychosocial Political
6. Offer better educational conditions to a considerable part of the school age population in the areas of the experiment.	Educational Evaluation Educational Impact of the Project	Educational Environmental
7. Develop and test methods and routines for the installation, operation, and maintenance of a ground equipment in the experiment and for the operation of the logistics and supervision networks	Evaluation of the Operational Aspects	Operational Administrative
8. Test the use of the artificial satellite as a signal-distribution element in a tele-education system	Administrative Aspects Operational Aspects	Operational
9. Analyse the results in terms of cost/effectiveness and cost/benefit ratios, comparing them to the current data of the traditional system	Cost/Effectiveness Evaluation	Educational Economical Administrative
10. Prepare personnel for project planning, control, material development, evaluation, and operation in the field of educational technology	Personnel Training Management	Educational

The Project activities were assumed by the organisms above mentioned, giving the desirable continuity to the pioneering work started by INPE in the area.

It is worthwhile to mention that one of the important consequences of the Project was the creation of a Master of Sciences Course in Educational Technology at INPE - the first one in the country - where 64 MS thesis were approved between 1975 and 1978, year in which that Graduate Course was disactivated.

Finally, the experience gained with the SACI Project showed that the effectiveness of the instructional system based on Educational Technology and using mass communication media is larger than the effectiveness of the conventional educational system.

Furthermore, the use of communication satellite in Education proved to be feasible and is now considered as one of the possible utilization of the first domestic Brazilian communication satellite to be launched near 1985.

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