

CHAPTER 1

A COOPERATIVE NETWORK FOR LEARNING MATHEMATICS

*Multicurso Mathematics: A Roberto
Marinho Foundation Project*

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1.1 Introduction

1.1.1 Information about the project

Title of the initiative: Multicurso Mathematics¹

Beginning date: Pilot-application: 2003/ 1st year of the application: 2004

Subject area: e-Learning/Digital Inclusion/Communication/Education/Mathematics

Site: www.multicurso.org.br

1.1.2 Information about the institution

Name of the institution: Roberto Marinho Foundation – FRM

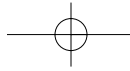
Institutional mission: To mobilize people and communities through social networks, communication and partnerships for the creation and the development of educational initiatives that contribute to the improvement of the quality of life of the Brazilian population.

1.1.3 Person responsible for the experience – contact information

Name of the responsible person: Eliane Birman

Position: Project Manager

¹ In English, the literal translation would be Mathematics Multicourse.



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1.1.4 Team members

Tele-education area general manager: Nelson Santonieri

Project manager: Eliane Birman

Project coordinator: Mariana Pinho

Project assistants: Ana Paula Teixeira, Cecília Rodrigues Peixoto, Livia Neiva, Rafael Costa

Trainee: Bruno Leal

1.2 Characterization of the Previous Situation

Multicurso Mathematics was developed with the objective of contributing to the improvement of basic education in Brazil, with main strategy being the *continued training for educators program*. The program was prepared based upon information from a diagnosis of the Nature Sciences, Mathematics and their Technologies in High School Education, which pointed out problems such as:

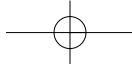
- A low level of mathematics proficiency in High School Education – only 12.58% of the students achieved an acceptable minimum level (Source: National Basic Education Evaluation System – SAEB, 2003).
- A lack of properly trained and motivated teachers.
- A demand for investments in Nature Sciences, Mathematics and their Technologies due to their strategic character for the country's scientific and strategic as well as its economic and social development.
- Lack of teaching materials in pace with the new technologies present in the lives of the students and current teaching trends.²

1.3 Objectives and Results Sought

Multicurso Mathematics' general objective is to qualify of the teaching of mathematics in High School Education. For the achievement of this goal the following specific objectives were developed:

- To foster an improvement in the teaching of Mathematics through the renovation of teaching practices. These changes must take into account the use of new resources and languages in the classroom and focus on the development of students' skills.

² In 2004, when the program was implemented, the federal government's National Didactic Book Program had still not been put into practice and, thus, added to this item was the lack of didactic books for the students.



- To create a Cooperative Learning Net within the Mathematics teaching environment, fostering greater interaction between teachers and school managers and allowing to build collective knowledge.
- To stimulate the teaching of the subject in a contextualized manner, appreciating local reality and favoring the development, in students, of a socially critical view and citizenship posture.
- To favor an improvement in the learning of mathematics and, consequently, the students' performance in the subject.

1.4 Description of the Experience

Multicurso Mathematics was introduced to innovate the models of continued training programs and *e-learning*, combining these concepts in order to create a pioneer methodology: the construction of Cooperative Learning Net. Thus, the following organizational structure was prepared (Figure 1.1).

The Multicurso Mathematics methodology follows the hybrid modality, interspersing live moments and distance education through a Virtual Environment.

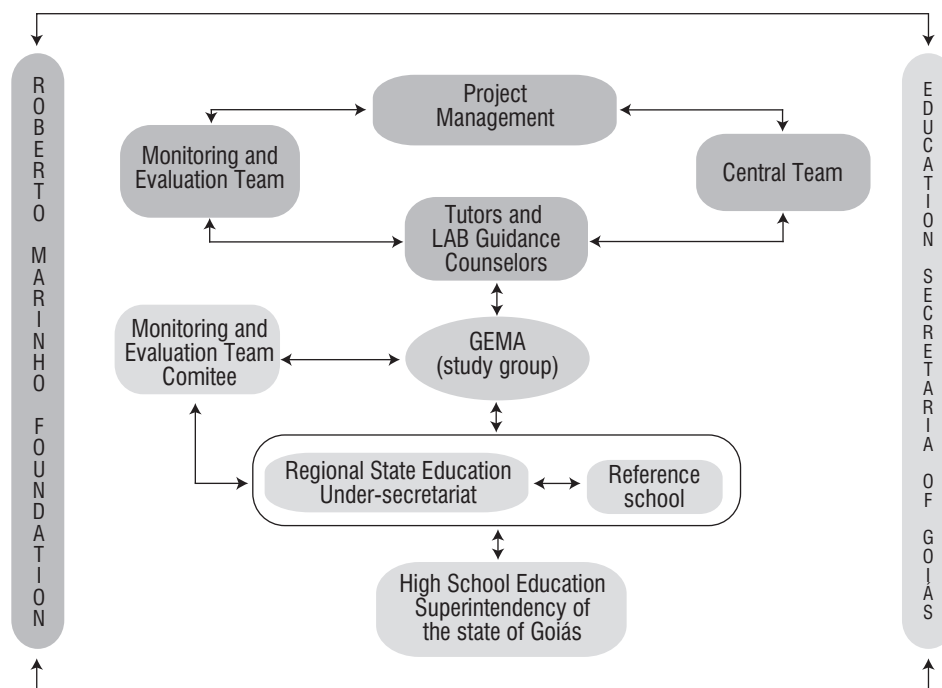
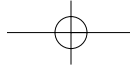


Figure 1.1 Multicurso Mathematics – organizational structure



1.4.1 Face-to-face Meetings: GEMAs and Seminars

Mathematics Study Groups (GEMAs) were created, holding fortnightly meetings in the schools to carry out study activities. Their tasks are oriented at a distance by tutors.

Every two months, the Roberto Marinho Foundation team, responsible for the coordination of the project holds on seminars, brings in GEMAs representatives – *coordinators* elected by the group and *alternates* selected on a rotating basis – *central team*, consultants tutors, invited lecturers and technicians from the Regional Educational Under-secretariats of the state of *Goiás* (SRE). During the event, central concepts to the program are systematized as well as those to be used in the subsequent bimonthly period. There also are workshops dealing with mathematical and teaching content. All of the events also make use of Virtual Environment Laboratories to clarify doubts and enhance knowledge about the available tools. In 2004, five seminars were held with the participation of 450 educators in each event. In 2005, other five seminars were conducted, in which nearly 600 educators participated each time, with the first one especially planned to welcome new participants in the program.

1.4.2 Distance education

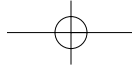
The Multicurso's *Central Team*, comprised of specialists in Education, Communication and Mathematics Education, prepares the frameworks that guides the GEMAs activities. This multidisciplinary team is also responsible for creating the program's theoretical-methodological basis and for the systematic interaction between the members of the group of tutors.

The study groups activities are oriented and directed by the 17 tutors who belong to the program, and who act as specialists in mathematical content, as study guidance counselors and promoters/managers of the network of people.

The Virtual Environment was especially prepared for the program with the objective of mediating the communication between each participant. Besides the specific tools for assigning tasks, others make it possible for the educators to interact between themselves, with the tutors and with the consultants. These include a message exchange service, an online instant messaging, a *photo album*, the *library*, and a *virtual message board*, by which the educators expose their doubts and opinions. Around 1,114,503 page views were recorded over 20 months, with an average of 40,000 views per month; 8,384 tasks were sent in/corrected; 72 chats established along with 92 forums and 239 blogs. The virtual environment structure won the Roberto Marinho Foundation *e-learning Prize* in 2005, and a seal of approval as *National Reference* in e-learning, awarded by Micropower company. The FRM also won the Digital Inclusion Prize awarded by the Telemar Institute, category Non-Governmental Organization, for the south and middle-west regions.

1.4.3 Cooperative Learning Net

The interaction between the different groups that constitute the Multicurso structure allows a knowledge sharing of classroom experiences and reflections regarding the studies about new teaching practices. Thus, the program fosters the building of collective knowledge, which enriches the educator's continued formation.



1.4.4 The Multicurso materials

Due to its focus on the teaching and learning process, Multicurso has two contexts for using materials: the didactic-pedagogical support for the teacher and the student in classroom activities; and the teachers continued training, updating them continuously. To do this, the printed and audiovisual materials are prepared by specialists who are in tune with the advances in scientific research and the pedagogical theories and practices in the fields of Education, Communication and Mathematics.

The Multicurso's didactic materials consist of: teacher's book and student's book for the 1st, 2nd and 3rd grades (sophomore, junior and senior high school grades)³; 44 video programs for the 1st grade; 44 videos for the 2nd grade; 30 videos for the 3rd grade; 79 forms that relate to mathematics and citizenship. All of the material was prepared in compliance with the federal government's Law of Education Guidelines and Bases and the National Curricular Parameters.

The materials for the Continued Training Program are: Notebooks with Frameworks for the GEMA meetings, GEMA Orientation Manual, Virtual Environment Guide, Methodological Approach document, explanatory videos referring to the activities of the Notebook Frameworks, institutional videos and reports through TV Multicurso.

1.4.5 The role of communication and motivation

Based on the principles of media-education, the program transposes the pedagogical use of the communication media, encouraging the educators to understand the educational process from the communicational point of view, taking into account questions such as the management of people, information, environment, language resources and communication relationships in the school.

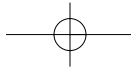
Communication planning is also designed to bring closer together the pedagogical practices in the students' fields of interest, expanding their motivation – fundamental for the consolidation of the Cooperative Learning Net features.

Intending to appreciate the work and role of the educator, the Multicurso created the *Free Expression Space*, which is put on each year during the regular seminars. Currently, the educators are invited to present their projects, express their opinions and offer suggestions or criticism.

These activities, coupled with the competencies built during the GEMA meetings, help the educators develop the feelings of security necessary for the emergence of their own, autonomous initiatives. In 2005, many of the Regional Education Under-Secretariats of the State of Goiás for the first time held regional meetings on mathematics or with Multicurso participants, while educators developed projects with their school students, associating mathematics with citizenship, technology, and other course subjects.

Print and audiovisual communication products (newsletters, *Redes* magazine and TV Multicurso) were created to establish permanent communication and outreach to all participants, even those who do not have access to the Virtual Environment.

³ In Brazil, high school has only three grades.



1.4.6 Monitoring and evaluation

In order to confer even greater legitimacy on the Continued Training Program, it is monitored and evaluated at each stage of application by an external team comprised of education project appraisal specialists. The product of these appraisals leads to the revising of the practices and procedures, in order to offer better service to the program participants. The main indicators observed are:

- Adoption of new ways for teachers to make their evaluations;
- The use of new classroom resources and methodologies;
- The quality of the teacher-student relationship;
- The level of students interest and participation;
- The awareness of mathematics students within the daily context.

Four periodic monitoring and evaluation reports are prepared along with a final report and the profiles of the entry and exit of teachers, school managers (principals and pedagogical coordinators), and students. These reports are based upon questionnaires that all participants fill out, observations of work conducted in the seminars and the schools (qualitative analyses by specialized professionals), and focus groups of students and educators (carried out through sampling). In this way, the Multicurso itself is approached from a perspective of “continued training”, improving all the time and satisfying existing needs of each state in which it is active.

1.4.7 Regional support

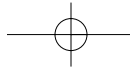
Regional Education Under-Secretariats (SRE) of the state of *Goiás* offer logistical support to the project and to the educators new initiatives. Keeping in mind the importance of this role in order to guarantee the program sustainability in an autonomous manner, the SRE technicians participate in the Monitoring and Evaluation Committee. Oriented by the external monitoring and evaluation team, they discuss management in Education and develop competencies in leadership and autonomy.

1.5 Implementation Stages

The pilot project was conducted in 2003, in four public schools in the state of *Goiás*.

In 2004, the program was run for the High School Education/1st grade in the state of *Goiás* public schools, reaching at 2,400 educators divided into 209 study groups, and 109,000 students.

In 2005, the program was applied to the High School Education’s 1st, 2nd and 3rd grades in the state of *Goiás* public schools, involving 3,000 educators organized into 247 GEMAs and 260,000 students from 591 schools. Other goals were added to the previous ones: development of a new Curricular Proposal for the state schools and implementation of the Research and Knowledge Production Laboratory (LAB), encouraging the practice of research and guiding educators to prepare reports about their experiences or articles regarding education issues and the school environment. The LABs are oriented at a distance by the tutors and by a team of specialists in the fields of Education, Communication and Mathematics from the Pontifical Catholic University of Rio de Janeiro (PUC-RJ).



In 2006, a partnership agreement was signed with the state of *Espírito Santo*. In the field of technology, two major innovations are foreseen: the creation of GEMINHAs (little GEMAs), spaces within the Virtual Environment dedicated to students of the participating schools that will follow the example of the GEMAs; and the development of new tools – a mathematics database and a teaching plan designed to expand the contributions involving an exchange of experiences directly linked to daily activities in the classroom.

1.5.1 The team

The Roberto Marinho Foundation team consists of eight persons and is responsible for managing Multicurso. The *central team* is comprised of nine consultants from the fields of Education, Communication and Mathematics. There are 17 specialized Mathematics tutors and 19 counselors for guiding LAB activities.

1.6 Solutions Adopted for Surpassing the Obstacles Encountered During Implementation

1.6.1 Training programs for the entire community

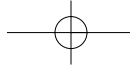
In order to comply with the Multicurso demands, tutors also participate in a continued training program. Among the contents used in the Tutor Training Plan are communication and autonomy skills that help leaders and guidance of the Cooperative Learning Net through the virtual environment.

1.6.2 Management of the virtual tool

The coordination for the Virtual Environment utilization, where each information flow generated by the community is published, is conducted by the program management team. Thus, the tool has changed substantially since the time in which the program has been implemented, adjusting itself permanently to the demands of the participants in the learning community. For example, between March and May 2004, the Virtual Environment was accessed 4,238 times. The need to develop support actions for users was noted. After preparing the Virtual Environment Guide and holding live workshops, increasingly higher number of accesses was registered, reaching 1,114,503 upon the completion of 20 months of the program. It is important to point out that, despite the fact that only 55% of the educators have access to the Internet, 95% of the groups send/receive tasks through the Virtual Environment.

1.7 Management Practices

The Multicurso's management is collective, with the participation of partners and consultants. All decisions regarding the program orientation are based upon the participants demands and the results pointed out in the monitoring and evaluation reports, which confers upon the program a customized production that satisfies the Cooperative Learning Net specific needs. The option to use an external monitoring and evaluation team was made in order to have a more objective view of the project as well as a permanent oversight.



The partnership between the Roberto Marinho Foundation and the Government of the State of *Goiás*, through the High School Education Superintendence of the State Education Secretariat is solid and transparent. The interface between the two parts is constant and allows the project to satisfy the expectations of both sides while also fulfilling its role regarding the qualification of the education, observing local peculiarities.

One of the program's strong points is the information management model. The FRM's management team coordinates the flow of information of the program's communication system, registering and disseminating the knowledge through a more dynamic virtual environment as well as the production of newsletters, reports for TV Multicurso, summaries, articles and other internal and external communication strategies. Media integration (web, printed materials and videos) helping people who learn with each other is one of the distinguishing characteristics of the program.

The Multicurso's success has been due to well prepared strategic planning that is constantly reviewed, as well as a flow of well-structured and monitored information that allows to apply the decisions that have been made. The choice of professionals with different and complementary skills for guiding the teams also has been an essential factor for the program's efficiency. This is all the product of quality management.

1.8 Results

The final 2004 evaluation report, which presents a summary of the program, shows the following data about the teachers:

- 96% adopted new forms of evaluation;
- 93% stated that Multicurso encouraged cooperative work;
- 78% declared program changed the school practices for the better.

The evaluation of the study groups (GEMAs) indicated that:

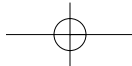
- 95% send/receive tasks through the Virtual Environment;
- 98.9% of the study groups state that the majority of their members believe that a teacher must invest in his or her personal training for classroom work.

Of the students interviewed for this same report:

- 87% guaranteed that the teacher involved with Multicurso better encouraged students to learn mathematics;
- 77% became aware of the evaluation as a motivation for learning;
- 79% had an improved relationship with teacher after Multicurso was implemented;
- 74% find and apply mathematics contents in their daily lives;
- 73% affirmed that the teachers used new ways for grading them.

Thus, mathematics is being demystified and incorporated into people's daily lives. The results are fewer failures, less truancy and more social inclusion.

In 2005, a survey compared the opinions about different aspects of the mathematical education of teachers working for the first time with Multicurso and those who were in



the second year of the program. It is possible to observe the changes that Multicurso caused in the classroom.

When questioned about the activities they have encouraged in their classrooms, most of the teachers who started in 2005 answered, *individual exercises* and *exhibitions making use of the blackboard*. Among those who have been in the program for two years, the answers were, *use of the student's didactic books* and *videos*, which shows the changes in teaching practices. Another piece of information that is noteworthy is with respect to the reasons that led students to have trouble with the subject of mathematics. The teachers who entered in 2005 pointed to *poorly developed logical reasoning* and the *absence of a didactic books for all students* as the main reasons. Among those who entered in 2004, the options chosen were *failure to dominate the necessary prerequisites* and *the little help received from the family*. Comparing the answers, one observes that the teacher's view of the student's reality attained an increased awareness.

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