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MATHEMATICS TEACHERS AND NIT RETHINKING COLLABORATIVE WORK AND DIVERSITY TO FOSTER PROFISSIONAL DEVELOPMENT

Conceição ALMEIDA	Universidade do Minho, Portugal
Diane MIDNESS	The University of North Carolina, EUA
Paulo DIAS	Universidade do Minho, Portugal
Carlos MORAIS	Instituto Politécnico de Bragança, Portugal
Luísa MIRANDA	Instituto Politécnico de Bragança, Portugal

In this paper we stand from a participant observers approach to describe a particular ongoing project of two mathematics teachers' partnership within a NIT context. This project relies mainly on electronic mail, threaded online discussion, and online chat for communication and on a web browser for searching and joint page building. Sharing information on resources and methods of teaching, and collaborative work toward students' motivation and involvement are the main features of the project. Another feature is the fact that the two teachers speak different languages and work within differentiated educational systems. A jointly naively constructed web site is, at the moment, the most visible product of this partnership, picturing the efforts of the teachers to lead the students in their exchange of mathematical and cultural information and in their search for the mathematics involved in their lifes.

Introduction

The growth of the new information technologies (NIT) and its spreading uses in education has been enormous. Our concern with mathematics teacher education (Grouws and Schultz, 1996) along with the increasing availability of both virtual information and modes of communication (Chen, 1997; Dias et al,

1998; Hughes and Hewson, 1998) led us to rethink teachers' professional development. Furthermore, as collaborative work (Wallace, Cedeberg and Allen, 1994), as well as the use of technology (Balacheff and Kaput, 1996), have become two of the focuses of the recommendations for mathematics teachers preparation and professional development, we cannot but envision its context within a framework of new information technologies. The avalanche of available resources on the Internet as well as one's access to it, is rapidly changing both one's views of a worldwide community, and one's conceptions of NIT usage (Schrum and Lamb, 1997).

In this line of thought we will present an ongoing partnership project (EB-V) protagonized by two mathematics teachers, one from Portugal and another from the USA. This collaborative project emerged from a broader American international partnership project, the *International School Partnerships through Technology* (ISPT) program.

This report will comprise brief descriptions both of ISPT, its means and resources, and of the project evaluation from previous years. In this context, goals and characteristics of the EB-V project will be presented, and its outcomes will be discussed with reference to positive and negative factors affecting them.

International School Partnerships through Technology (ISPT)

http://www.ga.unc.edu/NCCIU/ispt/isptinfo.html

International School Partnerships through Technology is a program of the *North Carolina Center for International Understanding* (NCCIU) from **University of North Carolina** which intends to bring international contact by the use of telecommunications to North Carolina high school students and teachers. Before the fact that some of the North Carolina high school teachers and students had limited international exposure, the purpose of the program was to create opportunities to use telecommunication technology to interact directly with teachers and students from other countries. ISPT main goal is to provide opportunities to use technology and to learn from international counterparts by establishing school-to-school, classroom-to-classroom partnerships and designing international projects to meet local needs. Supporting these goals is the strong belief that to function effectively in an interdependent global community students will proffit from international educational exchanges, and from resources and programs featuring person-to-person interaction and technology. The leaders of the project believe that, to face the challenge of competing in today's global marketplace, North Carolina students will need to build competencies, such as language and technology skills, respect for different cultures, ability to communicate across cultures, and ability to understand events in other countries and their impact on the U.S.

and North Carolina.

Schools participating in ISPT should use their Internet access for e-mail, for videoconferencing, for interactive chats, and for the production of World Wide Web pages whenever possible. NCCIU provides support and training for teachers to empower them to help others in their schools and communities to participate in further international projects. NCCIU also provides World Wide Web pages for project publications and cultural awareness resources.

ISPT in action

ISPT began in the spring of 1997 with two pilot partnerships. NCCIU attempted to find international partner schools that closely matched the needs of interested schools. ISPT completed its first full year during the 1997-98 academic year. Both participating NC teachers and NCCIU staff reported the project's success in supporting the teachers' curriculum objectives. Procedures and policies that could strengthen ISPT in the future were also identified.

For the 1997-98 school year, ISPT linked twenty-six schools across North Carolina with thirteen countries around the world to work on twenty-eight different projects. Participating schools were assigned the responsibility to provide the means for telecommunication. The only thing that was required is that the teachers were able to send e-mail. Training workshops for participating teachers were held November 14-15, 1997, and March 13-14, 1998, at Duke University.

The international partners include schools in Australia, Denmark, England, France, Germany, Guadeloupe, India, Israel, Japan, New Zealand, Norway, Portugal, and Spain.

A total of 1797 people were involved in ISPT including 33 NC teachers, 908 NC students, 36 international teachers, and 820 international students during the 1997-98 academic year. Students' motivation, awareness of others' cultures, and a sense of reality were some of their project goals pointed out by participant teachers. According to the 20 NC teacher evaluations received at the end of the school year, 75% of respondents felt that their goals were met or well-met. Not having had previous contact with partners, communications not being proper, delay of responses or total lack of answer from partners, and different time schedules were all pointed out by teachers as set backs for the project.

According to NC teachers' evaluations, the technical and programmatic support provided greatly facilitated school partnerships. In respect to the participating students, teachers reported an increase of understanding of the partnership culture and of technological competence.

An ISPT World Wide Web page (http://www.ga.unc.edu/NCCIU/ispt/) was developed as a resource for partner schools. This page includes the monthly newsletter as well as lists of resources for participating classes and others interested in developing international partnerships.

Teachers participating in ISPT are developing distance education modules using project based learning in their curricular areas. These modules use Internet access for e-mail, videoconferencing, interactive chats and the production of World Wide Web pages.

Projects varied widely depending on the subject matter, grade level, responsiveness of the partner, commitment of the teacher, and availability of technology. Web pages, notebooks on selected topics, videos, databases, collaborative short stories, surveys of partners on attitudes (e.g., on each other's culture, toward geometry, daily life activities, and preparing for work), e-mail messages on a variety of issues, and conducting Internet research on the counterpart culture are examples of students work. Examples of student work are listed in the ISPT newsletter published on NCCIU's website.

In 1998 a new partnership emerged between International School Partnerships through Technology and Koz, inc, a technology company in Durham, NC. Koz provides both a database powered software solution for publishing web pages and WWW based e-mail. The purpose is to use these resources to demonstrate how schools can use the Internet to work together collaboratively.

Each ISPT partnership was given its own web page. The simplicity of the software behind the pages make it easy for each partnership to provide their own content, add more pages, add feedback forms, publish student work, maintain a calendar, and have threaded discussions and chats. No HTML, FTP, or programming is required, although advanced users may do their own coding or use HTML editors without limiting core functions. The participant area of the web site can easily be made private so that only participants have access to it.

Using NIT to enhance Mathematics teacher professional development: the case of EB-V

http://education.koz.com/edu/eastbladenviso

By the end of the 1996/97 school year a young Portuguese Mathematics teacher faces students' lack of motivation and systematic failure in the learning of Mathematics. These seemed to be particularly deep in Geometry toward which a questionnaire confirmed negative attitudes. A retrospective on own teaching methods as well as on the students' school and social background led

the teacher to identify possible causes for this situation. A so-called traditional approach to teaching/learning Geometry, with the sole use of textbook, blackboard, and paper and pencil, was identified as a possible factor affecting both attitudes and achievement. Manipulatives and New Information Technology had never had place in students' learning experiences. Reflecting on classroom practices, the teacher recognizes that students have also been exposed to Mathematics only within a closed classroom context with very limited exposure to real world mathematical situations.

Although attending an urban school, the students are mainly from a low status social background with limited cultural exposure and very limited personal access to NIT. The recent availability of telecommunications technology in the school was seen as an opportunity to provide a crosscultural and multidisciplinary experience. Taking mathematical ideas beyond the Mathematics classroom might bring to life, in a very novel way, a subject matter which has been traditionally perceived as dry, isolated, and meaningless.

For the teacher, the prospect of access to both national and international Internet resources was a strong motivation. Particularly appealing was the opportunity of having personal contacts with persons from a different culture, and in particular, with a mathematics teacher with a different background and with more experience of telecommunications. Sharing information on resources and methods of teaching and collaborative work toward students' motivation and involvement were the main goals for the project.

A semi-structured interview made it possible to identify the teacher's need and motivation to develop new strategies for the teaching of Geometry. In the teacher's own words "to do something new and really different which could motivate and awaken my students".

A feeling of isolation and some uneasiness to try different teaching strategies without feedback from other teachers were also identified. When talking about teachers collaborative work, the teacher expresses the idea that "teachers do not always spontaneously share 'specifics' of their classroom teaching activities".

Concerning her future work with the students the teacher appears to be open to innovative teaching strategies using NIT. She states her goals as: to provide students with a multicultural vision of Mathematics; to access information which might be both motivating and awakening of students' curiosity for Mathematics and its beauty; to foster communication skills in the Mathematics classroom; to construct a WWW page which is informative, dynamic, fun, and motivating.

In face of these goals, and being made aware of ISPT, the teacher decides to submit to enter the project. Both the facts that English would be the project language and that the project works and interactions would take place within differentiated educational systems were pondered. These features were however thought as being more a factor of enrichment than a set back. Diversity was seen as a means to acquire new knowledge and new skills.

Being assigned an American partner, the enthusiasm of the teacher grew. Having to use the English language to communicate on line and by e-mail was not a barrier. The need to disclose both the content of the course and teaching strategies as well as her students' negative attitudes and failure, seemed to improve the teacher's reflection. The idea of working on a cooperative/collaborative cross-cultural project seemed to be welcomed by both partners.

The teacher reports her students' enthusiasm about the prospect of both communicating with American students on the WWW and using the computer to learn Geometry. It was hypothesized that talking about geometry and their feelings about it would improve the students' willingness to commit themselves to learning. The students were required to ask for their English teacher's help to send their thoughts to their American counterparts. However the participation from both sides was very limited due to technical difficulties.

The Portuguese teacher attended the Spring 1998 ISPT workshop and visited her partner's school in North Carolina. She reported having learned many new things about telecommunications and went back to school ready to use them. However, the subsequent happenings were not up to her expectations due to technical difficulties. Communication with her partner became very difficult. However the teacher kept her approach to the teaching of Geometry using resources from the Internet.

The ISPT project resumed on the following school year.

Contact was established with another American teacher far more experienced on the use of manipulatives and of telecommunication resources. The Portuguese teacher became enthusiastic again when there were opportunities for on-line chats and exchange of e-mails. E-mail letters began being exchanged also between the students. They presented themselves to each other and talked about their preferences.

There were initial ideas which showed difficult to implement: students talking to each other about their learning of Geometry, asking for help or challenging each other with problems; teachers exchanging of teaching strategies. The differentiated curricula were the main factor for this failure. Lack of timely communication was a second not less important factor. In the Portuguese school the technical resources were not as good as the ones in the

North Carolina school. The existence of only one computer connected to the Internet greatly diminished the possibility of communication. Nevertheless the Portuguese teacher managed to keep the students interest presenting them with printed information. On the part of the American school the resources were better with a computer in the classroom and with the availability of a computer lab.

With the emergence of the partnership between ISPT and Koz inc, the project began taking a new course. The opportunity to publish web pages with little technical knowledge opened a whole new vision for the partnership. The Koz resources provided the means for the two teachers and their students to work together collaboratively on a web page construction. Holidays and special days became the focus of interest for the students with exchange of cultural traditions and with the challenge to find mathematics within. Valentine's day was the pretext for a Geometry contest with the participation of both sides. Thanksgiving, Christmas, New Year, Valentine's day, and Easter each originated simple but informative and fun pages. These pages are the reflection of efforts to find good web resources related to mathematics.

The features of the Koz pages include feedback forms, a calendar, chat, a newsletter, and discussion threads. These are used for posting news about important events, for posting a questionnaire on attitudes toward Geometry, and for opening discussions on topics of common interest. However, the dynamic characteristics of the Koz pages seem to take time to be fully taken advantage of. The real communication and collaborative work within them is just beginning to evolve

Final comments

This is an on-going project with still few visible outcomes. However some considerations can be made concerning how the project evolved, its positive features and some difficulties which arose. Keeping up with every feature of the project, keeping in touch on a regular basis, reading all the e-mails, searching for information, maintaining the interest of the students through information and visits to the computer, working on the page construction, are all time consuming. The amount of information on the Internet can be overwhelming and requires a critical approach.

Planning for the project was not done jointly from the beginning, for which the differentiated curricula seemed to have been an important factor. In the Portuguese teacher's own words "planning evolved as a learning process" with the negotiation of both partners' different points of view. There is the

feeling that a "real" meeting would be in order to plan for the "virtual" collaborative work. Nevertheless, more frequent and on a regular basis chats, "at least every other week", were suggested as a possible way to overcome this difficulty.

On the other hand, chats should be more focused and rich as far as subject matter is concerned. There seems to be a suggestion that even the chats should be carefully planned. In this project, communication through chats and e-mail was more frequent in the beginning and had small subject matter focus. There was also an awareness for the need of *netiquette* in the communication over the Internet. Contact with a person from a different culture seems to have fostered some uneasiness, which nevertheless was overcome. Chat showed to be easier than e-mail exchange.

Lack of time from the part of the partners, differences in time, language, and different curricula are stated as not unsurpassable difficulties. Problems with the computers and the Internet, and the consequent unavailability of communication is the main difficulty pointed out.

The access to NIT and to relevant information seems to have made the project worthwhile for the Portuguese teacher. Surfing the web, electronic mail, chat, page building, working with dynamic features like the ones at the Koz pages were some of the skills acquired. In the whole it provided means to change her teaching in a way that was innovative and motivating for the students. Geometry sites were taken advantage of for the teaching of topics like transformations.

In respect to the students, dealing with NIT, even in such a limited way, seems to have been useful: "what they could not do at least they could see". Communication with American students was fun and very motivating. Another advantage was the contact with a different culture and the understanding of how important mathematics is in another culture. Furthermore the need to communicate in English helped develop language skills in collaboration with the English teacher.

Making changes and breaking barriers requires courage and creativity. This seems particularly true for the ones responsible for the education of men and women of the future. The NIT are a challenge to be faced by people with the vision to see beyond any frontiers and to reach out for new wonderful ideas.

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