PROJECT WORK WITH TEACHERS INVOLVED IN A PROGRAM FOR THE USE OF COMPUTERS IN EDUCATION

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This research describes the evaluation of a teacher training program set up to implement the use of computers as a support for project work. The teachers, who entered the program mainly with the motivation of learning how to use computers, recognized changes in their attitudes and pedagogical practices.

The national Project Minerva was established in 1985 to promote the introduction of computers in Portuguese elementary, middle and secondary schools. This project pretends to contribute to the technological updating of school curricula and methods, and has a concern for pedagogical transformation. Universities and Superior Schools of Education are charged with the training of teachers, curriculum development and its evaluation, as well as with the necessary support to the work carried out at the schools.

Teachers of several disciplines are involved in this project. However, many of those who are most interested and become leaders within the schools are mathematics teachers. So far, most of work involving students has been realized through extra-curricular activities. Some of the teachers tried to use the computer in the classroom, but this has been difficult given the scarcity of appropriate software and insufficient quantity of existing hardware.

To use the computer in the classroom does not imply necessarily a change of pedagogical attitudes, student/teacher relationships, and learning processes. The computer can just be used to reinforce a traditional style of teaching. In project work, students have the possibility to participate in the choice of the problems that they want to deal with and to define the corresponding strategies, methods, and forms of presentation of the results. This pedagogical approach, which remotes to Dewey and Kilpatrick, intends to assign the students a responsible and independent role in their own learning process. Dewey (1959) wanted to give a livelier content to education, in opposition to teaching just from listening and from books, by following the principles of motivation, dedication and organized work in order to achieve a learning goal. In his views about the use of computers in education, Papert (1980) also stresses the importance of the deep involvement of the students in the learning process through their personal project.

Many contemporary teachers are in a way or another sensitive to these proposals. However, project work is not easy to implement in a long term basis, and most for the actual activities carried out in today's schools still draw from the traditions of straightforward transmission of ready made knowledge, memorization, and passive learning. To make teachers aware of the possibilities, difficulties, and conditions of success of project work and to invite them to start using this methodology with their students, it seems reasonable to involve them in a set of activities of a similar format.

THE STUDY

This research intended to evaluate the effects of a training program in project work on teachers' attitudes concerning this kind of pedagogical strategy and to evaluate its effectiveness in developing their ability to conduct students in project work oriented activities, using computers. This evaluation was also intended to provide informa
tion to improve the design of the training program.

Specific objectives of the program on project work were to make teachers: (a) develop skills of organization and cooperation in group work, (b) develop research skills and the ability to organize and present information, (c) be aware of different aspects of verbal and nonverbal communication, (d) view knowledge in a interdisciplinary perspective, (e) recognize the importance of intrinsic motivation, and (f) stimulate their initiative and self-confidence.

THE PROGRAM

Involved in this study were 22 teachers, all participants in the Project Minerva. Of these, 13 were teachers of mathematics and 7 teachers of other subjects.

The training program was developed in two phases. The first phase consisted of a four-day workshop which main objective was to give an overview of project work methodology. The second phase concerned the implementation and evaluation of project activities in the schools.

In the first phase, a general problem was selected in big group discussion and then subdivided into smaller questions which were taken on by different subgroups. Each subgroup selected its own methodological strategies, including labor organization, data collection methods, data analysis, and forms of presentation of the results. After the presentation of each subgroup there was a discussion period in which the different contributions were confronted with the general problem initially defined. Finally, there was a general discussion to evaluate all the activity.

The second phase, included the introduction to the use of computer tools such as spreadsheets, data bases, word processing, drawing applications, an initiation to the LOGO language, and monthly seminars for discussing pedagogical themes related to the use of computers and project work and for exchange of experiences and reflection on the ongoing activities in the schools.

EVALUATION

There were two main periods of evaluation: the first took place at the end of the initial project work workshop. Since this activity represented for most of the teachers a first formal contact with this methodology, it seemed important to evaluate it just after the end of the workshop.

There was some discussion to decide if the problem to be selected should concern or not directly computers. The teachers decided that the computer ought to be regarded as just an instrument among others and picked up as their question "what can be done to improve the school?". This question was taken with enthusiasm by the participants, who assumed their role in the study of the subquestion in which it was subsequently divided. Some teachers felt uncomfortable in doing actual field work, but the pressures of the needs of the group overcame this difficulty. Most of the final presentations were quite creative and original. In a short Likert type questionnaire they reported to have enjoyed the workshop and some indicated to have acquired new pedagogical perspectives to use in actual practice.

In the second evaluation, carried out six months after the initial workshop, the teachers were asked to respond to a more detailed questionnaire. One group of questions concerned the self-evaluation of change of attitudes by the teachers themselves. Another group concerned the different activities undertaken. Three other open question asked for comments on the difficulties and the potential of project work. Twenty teachers answered this questionnaire.

The responses to the first group of questions are summarized in Table 1.

A global analysis of the responses to the questionnaire showed that in this phase of the work most of the teachers considered that the activities carried out contributed to improve, either highly or moderately, the quality of their work in the mentioned areas. For the whole set of questions, 39% of the responses indicated a high contribution, 46% a moderate contribution, 12% a low contribution, and 3% were "don't know" responses. The item that had most
TABLE 1

Contribution of the teaching training program to specific areas—teachers' responses

<table>
<thead>
<tr>
<th>Contributions</th>
<th>Don't Know</th>
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<tbody>
<tr>
<td>High</td>
<td>Moderate</td>
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<tr>
<td>A. Development of an attitude of permanent learning</td>
<td>95% 5%</td>
</tr>
<tr>
<td>B. Development of capacities of organization and techniques of group work</td>
<td>15% 60% 25%</td>
</tr>
<tr>
<td>C. Awareness of the importance of the affective aspects in the learning process</td>
<td>25% 45% 20% 10%</td>
</tr>
<tr>
<td>D. To view knowledge in an interdisciplinary way</td>
<td>40% 40% 20%</td>
</tr>
<tr>
<td>E. Awareness of the problems of communication in the school context</td>
<td>35% 60% 5%</td>
</tr>
<tr>
<td>F. Development of new perspectives concerning the role of the teacher in the school</td>
<td>40% 55% 5%</td>
</tr>
<tr>
<td>G. Development of a new relationship with students</td>
<td>40% 40% 20%</td>
</tr>
<tr>
<td>H. Development of the ability to stimulate and to support the project of the students</td>
<td>35% 60%</td>
</tr>
<tr>
<td>I. Development of a more positive perception of their function as educators</td>
<td>30% 50% 10% 10%</td>
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</table>

Positive responses concerned the development of an attitude of permanent learning. Following were the items D, F, and G. The items B, E, H, and I received mostly moderate responses. The answers of the mathematics teachers and of the teachers of other topics were similar for all items, except for items E, G, and I, in which mathematics teachers were more eager than the others in recognizing a high contribution of the training program.

A second set of questions concerned the specific contributions of the several moments of the teacher training program. Some of these moments had a pedagogical emphasis and others concerned the use of specific computer tools. The most valued of the pedagogical activities was the initial workshop (63% high). For the remaining, the teachers tended to rate higher the activities that were mostly related to their actual experiences. The sessions concerning the specific computer tools were in general quite highly rated (all with more than 42% high).

At last, in open questions, we asked for the opinion of the teachers about the difficulties related to project work as well as for suggestions for the improvement of the program. Most of the teachers indicated several difficulties that they face in trying to use the computer as a support for project work in their schools. A content analysis of the 51 answers indicated that the scarcity of available time and the insufficiency of material conditions, namely, computers and appropriate working spaces, were mostly referred (29%). Pressures from programs and the negative attitudes of their colleagues were also mentioned several times (10% and 18% of the answers, respectively).

Concerning the role that should be given to the reflection on the pedagogical aspects of the use of computers in education, 89% of the teachers agreed that this aspect should continue to have a strong emphasis in the program. However, they suggested a shift towards more practical issues and more exchange of experiences.

The projects developed in the schools by these teachers may be grouped in two kinds: projects with teachers and projects with students. In the first case, were offered courses related to the use of computer tools, such as drawing applications, word processing, and LOGO. There were also sessions for all school to show the educational potential of computers. In the second case, there were experi-
ces with LOGO and other computer tools in extra-curricular activities, as well as one experience on teaching Geometry in a 5th grade classroom. Projects such as the school journal and other interdisciplinary activities were also implemented in most of the schools.

A more detailed evaluation of all these projects will be performed on the end school year in order to improve the working methods and to divulge and extend this kind of activities to other schools.

CONCLUSIONS AND IMPLICATIONS

Overall, we tend to believe that this training program was quite successful. It seemed to have a reasonable mix of "pedagogical" and "technical" components, which reinforced each other and promoted teachers’ willingness to change some of their attitudes and practices.

The introduction to the use of computer tools and LOGO constituted for most of the teachers the main motivation. The discussion of pedagogical themes was appreciated and the teachers recognized it as important for the acquisition of skills in developing work projects with the computer in their schools. However, we feel that this pedagogical discussion should be more deeply rooted in teachers' practical experiences.

It would be unreasonable to expect outstanding results in a rather limited period of time. The in-service training of teachers should be viewed as a long term process. Particularly in this case, the teachers need to learn many new things about a new medium, the computer. However, these teachers are becoming leaders in their schools by introducing the computer as an instrument of pedagogical change. These teachers will participate in the training of their colleagues. So, this involvement may rather be an important part of the training program next year.

REFERENCES


EXPERIMENTATION OF THE MINI-INTERVIEW BY PRIMARY SCHOOL TEACHERS

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The MINI-INTERVIEW (Nantais et al., 1983) is a new tool for evaluation of understanding of mathematics at the primary level and is characterized by a short individual questioning sequence. Concerning the experimentation of this tool, we raised two questions: first, a question of feasibility, in which we tried to determine the conditions under which the teacher can use the mini-interview with each of her pupils in the classroom. The second question concerns the use of the mini-interview to determine if the teacher uses it as a tool for formative evaluation, in the sense of providing her with some feedback on her teaching and assessing the pupil’s understanding in the construction of the concept. This paper presents some results of the experimentation of the mini-interview by three first grade schoolteachers with all their pupils in their classroom.

The mini-interview has been devised to inform the teacher of the child’s thinking and reasoning; for the teacher who wishes to involve her students in the construction of their knowledge must be able to follow their cognitive evolution. That kind of information can only be obtained from individual questioning and this suggests a form of clinical interview as the tool to be used. To achieve its full value, this form of evaluation must be integrated in the teaching task and hence should be used by the teacher herself within the classroom. It is in answer to the needs of the teachers and also to stay within the restrictions of the classroom that we have designed a new tool for the evaluation of the child’s understanding of mathematics, a tool we have called the MINI-INTERVIEW.

The mini-interview consists of an individual interview of the pupil and is characterized by a short timespan (5 to 10 minutes) and a sequence of questions prepared systematically and rationally. This evaluation aims at the student’s understanding in the construction of conceptual schemes, and hence deals only with key notions in the mathematics curriculum. This is why the use of the mini-interview by the teachers requires a serious training in conceptual analysis as well as a good grasp of the methodological guidelines concerning the steering of an interview. This preparation enables them to determine criteria by which