Summary

The Integration of calculators in mathematics teaching: a new stage of technology, new forms of integration, a new type of experimentation.

Reference

Aldon G., Sabra H. (2009), *Intégration des calculatrices dans l'enseignement des mathématiques : nouvelle étape technologique, nouvelles formes d'intégration, nouveau type d'expérimentation.* Lyon, France: Institut National de Recherche Pédagogique.

Research team

The team « EducTice » from « Institut National de Recherches Pédagogiques[1] » (INRP).

Context

This research was built on earlier work on the use of Nspire technology in mathematics classes. It examines the impact of this integration of TI-Nspire technology (handheld and software) and mathematics instruction on the collective work of mathematics teachers and teacher/teacher and teacher/student interactions. It focuses on the effects of the integration of the two technologies on all resources and their organization for the teacher as well as for the student.

Questions

The research questions are:
• do the teachers have an interest in the integrated (handheld and software) solution? If yes, which solution?
• What educational use is implemented by teachers?
• How do students evaluate the success of the integration, including getting started with the handheld and software, and the role of Nspire in learning process.
• What are the changes in teachers' practice? What does this experiment involve for the teachers? What factors influence the evolution of teaching practice?
• What is the story of this experiment in terms of the evolution of collective practices and the potential design of resources (individual and collective)?
• What pedagogical resources are used by teachers and students? What is the evolution in the teachers' sources of documentation?
 • Under what contextual conditions (educational, organizational, educational ...) did this experiment operate? What are the factors that permit us to understand the successes or failures, local or global, in the integration of Nspire technology?

Research Setting: 10 high-school classes (grade 12) equipped with the TI-Nspire technology (handheld and software) in two computer rooms. Studied throughout one school year.

Study Sample: 250 students and 10 teachers (2 teachers were particularly followed).

Data collected: questionnaires, interviews, class observations, and resources designed by the teachers.

- *Student questionnaires:* two online questionnaires were completed by the students in 10 classes.

- *Teachers' questionnaires:* two questionnaires were completed by the 10 teachers involved in the experiment.

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[1]   National Institute of pedagogical research in France

- *Students' interviews*: students chosen for their positive or less positive attitude towards mathematics.
- *Teachers' interviews*: with the two teachers particularly followed. Several interviews during the year of experiment.
- *Class observations*: two classes were observed. The observations focused on the professional teachers actions and implementation of designed resources, the interactions between teacher and students, and the use of handheld and software.

Also, the researchers obtained data from the experimental practical test in mathematics at the end of the year (part of the high school final assessment).

Major Findings

Among the results of this research:
- The extension of the work done in the computer room (with the software) by activities in class or at home with the handheld is a fundamental element which favors the dual-technology solution;
- Both versions of TI-Nspire technology inherently include a documentation aspect (organizing resources, exchanging, transforming, creating) that have impacts on the work of teachers and students;
- TI-Nspire technology is easy to access, though at the very beginning, teacher training is necessary;
- The introduction of the TI-Nspire technology is a factor favoring the transformation of teacher practices but the technology is not the sole cause of the transformation;
- The presence of professional development can optimize the time to getting started with technology. This training can be internal (between the teachers in the same school) or external (by experts);
- The resources used by teachers are built on their previous experiences. The way in which the form of resources used by a teacher change is related to their professional habits and is gradually and continually developed.

Conclusions

We noted the need to support teachers, particularly for resource design and their use in specific scenarios in the classroom to show how to integrate the technology in maths lessons.

The technology is a lever for change in teaching practices, but must be accompanied by training.

This research could be extended by a thorough study of the technology used by teachers and students, linked to resource design and effective learning,.