

TI-Nspire International Research: Pilot Projects 2007-8

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Abstract. The paper summarizes the results of a survey of TI-Nspire CAS pilot sites in the teaching of Mathematics conducted in 2007-8 by Texas Instruments. After a brief description of the main characteristics of the sample, some relevant teacher and student answers are considered. The goal of the analysis is to study not only technical aspects of TI-Nspire CAS, but its impact on motivation to learn Mathematics, as well.

Summary. Analysis of student and teacher surveys suggests that both judge positively the technical features of the TI-Nspire CAS handheld.

Both types of respondent think that TI-Nspire CAS is easy to use. They reported that developing confidence in the use of the handheld does not require a long learning time.

A very important point for users is that TI-Nspire CAS provides in one tool an integrated environment in which makes it easier to study and to learn Mathematics.

Both teachers and students underline that TI-Nspire CAS makes it easier to approach Mathematics in a more strategic way. Indeed, the handheld seems to be naturally intended to facilitate posing and verifying conjectures and hypotheses. As the international literature of the teaching of scientific subjects shows, this affordance is particularly helpful to improve the learning of Mathematics and to make easier the transition from abstract and procedural mathematical knowledge to its general application.

¹ The views expressed in the articles are those of the author and are not the responsibility of INVALSI.

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INTRODUCTION

Starting in the school year 2006-07 Texas Instruments conducted several pilot projects in Europe to study the impact on Mathematics teaching and learning of the TI-Nspire CAS handheld. This paper reports on the second year of the pilots, 2007-8.

The main survey goal is to study the opinion of students and teachers about the impact of the handheld on the learning and teaching process, respectively. As in the previous year of the project, this year's study is based on two survey questionnaires, one administered to teachers and one to students near the end of the school year.

Both the student and the teacher questionnaires have several questions to investigate the most important features of TI-Nspire CAS. The teachers' survey also tries to discover if they need more support or help during the different phases of the pilot study. Another important goal for both surveys is to understand if TI-Nspire CAS produces a gain in the student learning. Teacher and student satisfaction was investigated, as well.

Table 1 shows teacher and student participation to the survey in the different European countries.

Country	Teachers		Students	
	Frequency	Percentage	Frequency	Percentage
A	6	7,1	45	3,6
B	6	7,1	80	6,4
CH	2	2,4	16	1,3
D	21	25,0	295	23,6
DK	6	7,1	40	3,2
F	21	25,0	298	23,9
I	-	-	37	3,0
N	4	4,8	70	5,6
S	5	6,0	26	2,1
UK	13	15,5	342	27,3
Total	84	100,0	1249	100,0

Table 1. Teacher and student distribution

TEACHER SURVEY

More than 76% of teachers used TI-Nspire CAS at least once per week, and more than 50% used it for two or more lessons per week.

As in the previous year's survey, the majority of teachers reported they use TI-Nspire CAS handheld with an OHP ViewScreen (50%). About 19% of teachers use TI-Nspire CAS with data projector (alone) and another 25% use TI-Nspire CAS with an interactive whiteboard, as well.

On average the surveyed teachers have a good experience with graphing calculators. Indeed, they reported using these technologies for more than 8 years.

Turning specifically to TI-Nspire CAS, some very interesting patterns emerge.

- more than 43% of teachers think that TI-Nspire CAS makes it easier to reach pupils who are having difficulty learning mathematics;
- approximately the same percentage responded that their pupils have a deeper understanding of mathematical concepts;

- about 44% of teachers think that TI-Nspire CAS exercises a positive influence on student motivation;
- more than 52% of teachers responded that their pupils are more engaged and on task during Mathematics lessons using TI-Nspire CAS.

A series of questions asked how TI-Nspire CAS eases transition from calculation to concepts. About 45% of teachers responded that by using TI-Nspire CAS, students have a deeper understanding of mathematical concepts, and about 35% of teachers responded that TI-Nspire has helped the pupils to explain their mathematical thinking.

About 62% of interviewed teachers responded that by using TI-Nspire CAS, pupils are able to choose the appropriate representations (graph, equation, table or verbal description). Even more important (about 64% agreement) is the increase of student ability to use TI-Nspire to dynamically link different mathematical representations. Teachers responded that this latter capability supports their teaching and pupils' learning, an opinion which is consistent with international research on mathematics learning. The research shows that this approach to Mathematics is critical to acquiring the deep meaning of mathematical concepts.

About 54% of teachers say that with TI-Nspire CAS they have at their disposal in one software product the only technology they need for their teaching. This is particularly important because it ensures the handheld has sufficient flexibility for the teacher who has to work with different types of content in his or her teaching.

Teachers said they felt confident in using TI-Nspire CAS in their classroom: about 62% of the respondents agreed with this statement. Teachers reported they needed an average of only six weeks to feel comfortable with the TI-Nspire CAS technology. Furthermore teachers think that students also acquire very quickly a level of confidence in use of TI-Nspire CAS. On average, teachers responded that pupils are able to be confident with TI-Nspire CAS within eight weeks.

In general, it is possible to conclude that teachers have a good feeling about introducing TI-Nspire CAS technology, to contribute to an environment that they judge positively in terms of student attitude toward Mathematics learning.

STUDENT EVALUATION

As shown in table 1, the sample investigated students is fairly large. It permits analysis in depth of student opinions about TI-Nspire CAS.

The large majority of students responded that TI-Nspire CAS was used only as a handheld or as a handheld and with the personal computer.

Students learn the TI-Nspire CAS handheld very quickly. Indeed, more than 53% said this process was very short.

About 45% of students affirmed that TI-Nspire CAS is helpful to identify different approaches for the solution of Mathematical problems. Obviously, this is crucial because it helps students to understand mathematical concepts in depth. Furthermore, about 50% of respondents said that TI-Nspire CAS facilitates a cooperative approach to the learning of Mathematics. An even larger percentage (54%) said that TI-Nspire CAS is a good tool to estimate and check answers, and that is TI-Nspire CAS' versatility encourages an experimental approach to Mathematics.

About 57% said that with TI-Nspire CAS is easier to see the relationships between graphs, tables, and equation together on the same screen, and this helps students to understand the logic of the mathematical concepts. Even more important is that about 50% of respondents said that TI-Nspire CAS technology helps to choose the best representation to solve mathematical problems (i.e., graph, equation, table, or verbal description). This point is crucial, given the emphasis in the literature of Mathematics teaching for students to reach a level of competence in choosing the best way to depict a problem.

About 57% of students said they were able to solve more difficult mathematical problems by using TI-Nspire CAS, and the same percentage said they understood Mathematics more deeply because the availability of TI-Nspire CAS.

TI-Nspire CAS seems to exert a positive influence on student engagement and motivation. More than 40% of students reported feeling more actively involved in learning mathematics when using

TI-Nspire CAS. Furthermore, about 45% of respondents affirmed they were more motivated to learn Mathematics when using TI-Nspire CAS. As we know, these factors play a strategic role in facilitating the learning of Mathematics, because they increase the feeling of self efficacy of pupils.

In general, the student judgment about the ease of use of TI-Nspire CAS is positive. Only about 7% of respondents reported that TI-Nspire CAS is too complicated.

CONCLUSION

The analysis of the surveys of students and teachers yields a very positive picture of TI-Nspire CAS. Both teachers and students judge positively the technical features of the technology.

Both types of respondent think that TI-Nspire CAS is easy to use and does not require a long time to use it with confidence.

A very important point for users is that TI-Nspire CAS allows them to have at their disposal in a single tool an integrated environment which makes it easier to study and to learn Mathematics.

Both teachers and students emphasize that TI-Nspire CAS makes it easier to approach Mathematics in a more thoughtful way. Indeed, the technology seems to be naturally designed to facilitate posing and verifying conjectures and hypotheses. As the international literature on teaching of scientific subjects shows, this process is particularly relevant to improving the learning of Mathematics and to easing the transition from abstract mathematical knowledge to fully developed mathematical understanding and skills.