

Math: A national matter or not.

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Abstract: In this paper the use of English language, the international one, is tested for improving mathematical understanding before Greek university students. By holding a within subjects experimental stance, I reach the conclusion that such an innovation is not well received as it was proclaimed to be. Minority issues in math education and its appropriate language use also occur in this work.

I can say I am inspired to write this paper by a well-presented work at the 3d Mediterranean Conference for Math Education by a group of Czech colleagues (Hofmannova & Novotna, 2003). This paper really sublimated teaching of Math in English before Czech students. My long time experience of teaching Math to nonmath majors has proven quite the opposite.

Greek students, although pioneers in obtaining English language certificates by renowned schools such as Cambridge and Michigan, appeared not satisfied when lecture was presented before them in the English language. Neither did they accept the superiority of teaching essential math theorems in another language, nor did they find it useful when a word-to-word translation from English was tried.

That attitude posed me a really hard question. First of all, what the reason would be to react to such an approach, the nationalists feeling, inhibition of understanding math ideas whatsoever. Secondly, taking into account how many students choose every year an English speaking country for a graduate degree, it is of vital importance to analyze their demeanor.

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Language filtering and understanding of Math.

I have emphasized several times that the teaching language, (Mamona, I. 2008) especially when Math is involved, although emanated from the national language, is a three-fold set.

1. language between teaching staff
2. language of interaction between teachers and students
3. vocabulary used among students (sometimes slang might be proven helpful while teaching).

The numbering I have selected is not arbitrary, it is a decreasing sequence from the sophisticated to the colloquial style of language. An endless discussion can take place as to which one of the above mentioned should be used during every day teaching practice. Two poles are presented: those who follow 1, advocates of an austere advanced level math language and those who converge to 2-more vulnerable to 3- that they risk everything to reach Math to the average student. Notwithstanding which procedure is observed, experimentation proves that no deviation from the national language is advisable. Vocal proponents of the use of English, the international language, should demonstrate a little bit more patience and I will surely leave that open for discussion.

Experiment based on a 30-student group at the TEI of Athens.

30 students, among whom the most qualified K-12 graduates are present, have entered the Informatics Department of the Technological Educational Institute (abbreviated TEI) of Athens. A compulsory course during their second semester is Probability and Statistics, theory and lab.

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Introducing them to the probabilistic terminology passes through the differentiation between two fundamental concepts: *independent* and *mutually exclusive* events. Two one-hour courses are usually dedicated to familiarize students with the above ideas and enable them to handle entailing exercises of average degree of difficulty.

As soon as I have presented the material in the national language, I discuss with them how they would receive the same ideas expressed in English. Out of the 30 students, 12 possess the Cambridge proficiency (5 out of them have succeeded both in Cambridge and Michigan), 8 are preparing themselves for this exam and the rest 10 have already taken or await results of the Advanced Certificate in English. In other words everyone in my sample is eligible to study in an English speaking country. I am talking of course about the undergraduate level in any country where English is the language of instruction. If it came to America, they would have to take TOEFL, but holding a certificate at least on the Advanced level usually enables any candidate to achieve the required result asked by the TOEFL administration.

A priori I pose them the question

Do you think that by presenting the material in English would appeal to you

- a. easier
- b. more difficult
- c. the same.

By writing down their really enthusiastic retorts I have the respective numbers and percentages

- a. 17 (57 %)
- b. 6 (20 %)

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c. 7. (23 %)

Collaborative learning (Panitz, T. 1999) is used in either approach followed, the concept expressed so explicitly by Ted Panitz, Cape Cod Community College. I have seen many times in mathematical journals people to invoke the National Standards of AMS. Here I tried to appear more loyal to the standards institutionalized by Amaty, which in my opinion fit better the transition gap between high school and the first college years, (Beyond Crossroads, 2006).

Having in mind to employ a within subjects experiment, not to remote myself from my popular and every day used statistical language, I presented the material covered before in Greek according to the so acknowledged probability gospel by W. Feller (Feller. W, 1986). Obviously there was terminology that had to be translated right away into the native language, instances when a word-to-word translation inevitably occurred, but in general teaching process has never been seriously interrupted out of a language misconception.

Finishing the presentation I posed the same question again introducing the appropriate changes

By hearing the lecture in English did you find it

- A2 easier to understand
- B2 more difficult
- C2 no difference at all

and herewith are their responds

- | | | |
|----|----|-------|
| A2 | 10 | (33%) |
| B2 | 14 | (47%) |
| C2 | 6 | (20%) |

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Comments on the appearing situation

By simply viewing the numerical results, we conclude that half of the class did not approve introduction of the English language while teaching Math. Just one third out of them seemed to be satisfied by that innovation and one fifth remained absolutely neutral.

One might easily support the opinion that teacher's performance, my performance, in other words was poor enough to persuade the average student that a language change would improve the depth of understanding. Fundamental honesty would not let that chance diminish. On the other hand self-justification urges me to say that I already possessed the former good testimony while teaching Applied Finite Math 105 at Cornell. There Tom Rishell and Maria Terrell (Rishell, T. & Terrell, M. 1986) had really besieged us in the broad sense of the word to be really effective teachers. If I remember well there were even persons at such a highly competitive research institution as Cornell that achieved much desired tenure or the equivalence of it on the basis of their teaching credentials. Unfortunately in Greece this vital component of college performance goes mostly unheeded.

Collaborative learning principles have to be applied to fathom reasons behind this phenomenon. One of the prevailing good students, answering B2 says
Student A At the beginning I really enjoyed the idea of hearing the lecture in English. It was as if I were prepared for my future graduate study. As you said-the teacher- the depriving prefix *a* of the Greek language really startled us at the outset of the material. Nevertheless when hearing the two word compound *mutually exclusive*, the adverb mutually made me conceptualize more leading me in sort of loosing the next thought

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of trail. Maybe it is I, but I do prefer the classical native terminology, you get used to it after all.

This student intends to go on graduate study, he is already involved in grading homework out of his smartness and diligence in addition to his need for financial assistance. A two-word term seemed to confuse him and make him staunch of the native language's use.

Another student, a vocal proponent of A2 retorts

Student B To me, an informatics major, Math is a rather boring subject. Unless it involves visualization like diagrams, sketches etc. it does not seem attractive to me. An innovation such as a language change made me more willing to participate in the activities.

Student B characterizes more or less the whole group of A2 supporters. To me it was quite impressive that students traditionally opposed to a theoretical subject like Math were fond of employing the English language in its teaching. I can interpret it as a popular deviation from the established procedure, which for the nonmath oriented student provides sort of escaping. I do not want to risk expressing that they viewed the whole lecture as a game. Naturally there is a global trend of the so-called recreational mathematics, publishing its own journal. Nevertheless I cannot articulate that for a mathematician an answer of the preceding style of student B will be well received.

A more enlightening opinion, supporting that sticking to native language appears more enticing to making Math more understandable, follows. This student is a representative of the Albanian minority, whose members usually come from families with low socioeconomic profile. But, maybe adjusting to the American minority pattern, they demonstrate an unbelievable eagerness for learning. Going into the

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deeper grounds for such an attitude would take us days and be quite useful. I have seen an excellent piece by American colleagues (Anhalt et al, 2002) emphasizing on their predominant Spanish speaking minority group and analyzing their demeanor toward mathematics and I do aim at preparing an analogous work in the near future focused on our own educational situation.

Student C To me lecturing in English, although sounding impressive made it sort of harder to deeply understand what was really going on. I did encounter problems with some Greek terminology, but listening to those math definitions in English entailed a two-phase procedure. I had to translate right away into Greek and without much understanding it back to Albanian. It was tiring, and if I had not heard the lesson before, I would surely have needed much more time to familiarize myself with the presented ideas. It seems to me **as if I opened two dictionaries at the same time.**

The last phrase really expounds the whole situation. No matter how well and fluently you master a foreign language, when you attend a hard-core subject such as Math you cannot avoid translating from your own native language. For a minority student this implies twice as much work to be done. It is unquestionably right that by spending more and more time working Math on a foreign language, it can lead you to an approximation of the ideal state not to resort to the use of the native one. This requires at least a number of months-not to mention years- and a certain amount of personal talent and aptitude for languages. What really comes in favor of my opinion is the real life situation as experienced by a Greek-American community college math professor. He had spent a lifetime teaching Precalculus and Linear Algebra in the freshman and sophomore years and been voted the most popular teacher in a certain year sequel.

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When extorted to write a book that would bridge the gap between high school and first year college mathematics, this whet his appetite to such an extent that he devoted part of his life to fulfill this target. When the writing came to the fundamental chapter of factorization- a necessary and sufficient tool for solving equations-he could not throw away the shadow of his early junior high school education in Greece. He left with family for the States at the age of 15. According to traditional Greek educational curriculum, the last class of junior high school concentrates on factorization (Papastavridis, S. 1989). When finishing the chapter and asking colleagues for potential corrections, he did realize that it was the worst written till that time material. His mind was vibrating between what he had absorbed as a high school student in his native country and what he performed in his every day American teaching practice. What we have experienced as children and teenagers have marked our lives, (Ernesto Sabato, 1988). The language he had grown up with during his adolescence made its appearance and shaped his thought, although he spent more of his lifetime in the States.

I contemplate putting an end to this point of view. I am quite sure it will provide the average reader with material for further discussion, which can be continued on a separate paper, through Internet or even during a conference. Discussing with anyone involved in the educational process has proven an endless source of inspiration to me. Notwithstanding the reaction that might provoke, such discussions and policies presented in a paper form really are much more helpful when I find myself before students than the statistically based works.

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