

# Mathematical proof and students' beliefs about counterexample at non-mathematical faculty

(Talk)

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Over the past several years we have turned our attention to the difficulties which students have in understanding and using mathematical proofs and the role of a proof in education of non-mathematics students.

The reason for that is our belief, as Epp [2] says, that our students also need to function in a mathematically sophisticated environment. One of the goals of discrete mathematics courses is to enhance students' logical reasoning and proof writing abilities.

In our previous research we investigated to what degree and in what ways are students able to construct proof in classroom, do they recognize a proving method used in a theorem (direct proof, contra positive claim, counterexample, etc.) and what are their conceptions and attitudes about mathematical proof. Two tests and a questionnaire were given to second and third year undergraduate students at Faculty of Organization and Informatics University of Zagreb (approximately 200 students) in order to pursue these questions. We came to conclusion that minority of students recognize or appreciate the importance of a proof but there are those who gain from it.

The reason for that is perhaps that mathematics is not their core study, it is just an exam to pass. Also, they do not realize that ideas presented in proofs are helping them to enhance their logic and abstract thinking which can be very useful in their professional life (for example, many algorithms are actually slightly different versions of proofs).

Recommendation was that we can enhance students' acceptance of proof if we analyze and explain benefits of a proof to students more often and if we connect it to other elements of course (like algorithms, applications etc.).

Now, after we reconsidered our own advices, we focused on three issues. The first of them is the importance of logic for students at our faculty. The second is the influence of students' background and personal beliefs on their ability to understand and reproduce proofs. The last one is the understanding of counterexample as a method of disproving mathematical statements. The reasons for the third issue are students' accustomedness to deal only with true statements and reasoning that proving is exercise only for confirming given statement.

This time, besides two tests and a questionnaire, every mid-term test will contain questions regarding these topics and will be given to students. We have broadened our sample on first year undergraduate students at Faculty of Organization and Informatics (approximately 500 students, together with second

and third year). As well as Epp [2] concluded, we found out that some students live in a different logical and linguistic world from the one mathematicians inhabited, a world that made it very difficult for them to engage in the kind of abstract mathematical thinking we are trying to help them learn.

**References:**

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