

COUNTER EXAMPLES AND CONFLICTS AS A REMEDY TO ELIMINATE MISCONCEPTIONS AND MISTAKES: A CASE STUDY

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This case study deals with typical students' misconceptions in first-year university engineering mathematics courses. Unfortunately sometimes those misconceptions were caused by mistakes and mathematical inaccuracies in textbooks. In order to eliminate misconceptions and correct mistakes counter examples were used. The students were given the extracts from their textbook containing mistakes and were asked to give counter examples. They had enough knowledge to do that. However, for most of the students that kind of activity was very challenging and even created psychological discomfort and conflict for a number of reasons. Some of the reasons were consistent with findings from another study of the author (Klymchuk S, 1999).

In this study, practice was selected as the basis for the research framework and, it was decided 'to follow conventional wisdom as understood by the people who are stakeholders in the practice' (Zevenbergen R, Begg A, 1999). The theoretical framework was based on Piaget's notion of cognitive conflict (Piaget, 1985).

Below are some examples of bad mistakes from the textbook (Bolton W, 2000) that were used in the study:

- 'With a continuous function, i.e. a function which has values of y which smoothly and continuously change for all values of x , we have derivatives for all values of x ' (p.332).
- 'If $\frac{dy}{dx} = 0$ then y is neither increasing nor decreasing' (p.353).
- 'At a maximum $\frac{d^2y}{dx^2}$ is negative and at a minimum positive' (p.353).

Eighty students were questioned regarding their attitudes towards the method of using counter examples to eliminate misconceptions. The majority of the students reported that the method was strong, effective and successful.

References

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