



NORWEGIAN
BUSINESS SCHOOL

Importance of conceptual thinking and talking for mastering mathematics

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Objective

To identify critical incidents that result in failure at mathematical exams



Critical incident

Any recognizable human activity that is sufficiently complete to give explanatory meaning

Research design

- **Critical incident interviews with three essential questions and extensive probing**
- **Sample: 19 students who had just failed their first year mathematic exams**
- **Analysis by Grounded theory approach**

Nearly all of them started out with saying

- I'm not strong at math
- I've always struggled with math
- I can't manage math

They talked about

1. Having practiced to little
2. Practicing, but not managing
3. Bad teachers
4. Not understanding
5. Anxiety for appearing stupid
6. Frightening formulas,
7. Not having any students to collaborate with
8. Too fast lecturing
9. Procedures which seemed nearly identical
10. Not knowing when the calculation was finished
11. Not daring to ask
12. Leafing through the book without recognizing

The critical incident turned out to be:

Lack of conceptual understanding

The solution

Talk about mathematics by using mathematical concepts



The concept of «equation»

How do you understand this concept, included in relation to other relevant concepts?

(This question was given to the participants of the Show & Tell-presentation. They were asked to go together in pairs to have a dialogue about the concept. Afterwards they were asked if the talking had increased their understanding of the concept.)

Summary

- **First year business students who had failed their mathematical exams were interviewed according to Critical Incident Technique to uncover possible common causes of failure. The students had practiced mathematical operations, but had never reflected upon or talked about mathematical concepts. Without conceptual understanding, exam questions were not recognized.**