

# A Study of First Year Students' Experience of the Transition from Second Level to Third Level Mathematics

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# Introduction

In February 2006 and February 2007, first year students in

St Patrick's Drumcondra (SPD),  
IT Tralee (ITT),  
NUI Maynooth (NUIM),

were surveyed in order to gauge their attitudes to mathematics and to measure their mathematical literacy.

The data collected will be used to investigate the students' experience of the transition to third level mathematics.

# Transition

- The transition from second level to third level presents difficulties in most subjects.
- The problems seem to be more serious in mathematics. (Kajander and Lovric, 2005)
- Studies often focus on academic performance and retention.
- In this study, we asked students to describe their experience of the transition in their own words.

# This Study

The participants were

- First year Engineering students at ITT,
- First year Mathematics students at SPD,
- First year Mathematical Studies students at NUIM,
- First year Science students at NUIM.

There were

- 316 students in total.
- 184 females (58%) and 132 males (42%).
- 29 (9.2%) mature students.
- 142 (45%) took HL mathematics, 169 (54%) took OL.
- Mathematics was compulsory for 149 (47%) students.

# The Questionnaire

- Students were asked how they found the transition from second to third level mathematics.
- Students were asked to describe the differences between second level and third level mathematics.
- Students were asked what they liked about third level mathematics.

# Methodology

- The data collected in response to the open questions was analysed using a grounded theory approach. The aim was to discover the theory implicit in the data.
- A subset of responses to each question was coded to identify categories.
- Further sampling took place until saturation was reached.
- The process was carried out by two people independently, minor discrepancies were discussed and a final set of categories and codes were agreed.

# Did you find the transition from second level to third level mathematics difficult?

- 263 students answered this question.
- 145 (55%) said that they had not found the transition difficult.
- 118 (45%) said that they had found the transition difficult.
- There were no significant gender or class group differences.

# Did you find the transition from second level to third level mathematics difficult?

- 48% of students for whom mathematics is compulsory found the transition difficult.
- 42% of students who had chosen mathematics found the transition difficult.
- There was no significant difference between the responses of students for whom mathematics is compulsory and those who had chosen to study mathematics.

# Did you find the transition from second level to third level mathematics difficult?

- 28% of students who had studied Higher Level (HL) mathematics found the transition difficult.
- 59% of students who had studied Ordinary Level (OL) mathematics found the transition difficult.
- There was a significant difference between the responses of HL and OL students.

# Did you find the transition from second level to third level mathematics difficult?

When the mathematical background of the student and the nature of their third level course is taken into account the group of students who seem to have most difficulty with the transition are the OL students who have chosen to study mathematics at third level.

HL Chosen who have difficulty with the transition.	HL Compulsory who have difficulty with the transition.	OL Chosen who have difficulty with the transition.	OL Compulsory who have difficulty with the transition.
21%	38%	66%	52%

# Comments on the Transition from School to Third Level Mathematics

- Topics are familiar from school.
- Maths is harder at 3L.
- Maths is more indepth at 3L.
- Maths is easy at 3L.
- Lots of new material at 3L.
- Maths at 3L is different but not difficult.
- Topics are started from scratch at 3L.
- Maths is not procedural at 3L.
- Pace is quicker at 3L.
- More help is available at school.
- More independence is required at 3L.
- Bad teaching at 3L.
- Good Teaching at 3L.
- Tutorials are good at 3L.
- Maths is difficult for OL students

# Comments on the Transition from School to Third Level Mathematics

- 273 students made comments regarding the transition.
- The most frequent comment was that topics in third level are similar to those in second level, with 59 (18.7%) such comments.
- 46 (14.6%) of the comments mentioned that mathematics was harder at third level than at second level.
- 26 (8.2%) said that third level was not procedural.
- 23 (7.3%) said that third level was more in-depth than second level.
- There were 17 (5.4%) comments saying that the transition was more difficult for those students who had studied Ordinary level school mathematics.

# Comments on the Transition from School to Third Level Mathematics

- For the **students who did not have difficulty with the transition** the comment mentioned most often was that topics were familiar from second level. (36.6%)
- Very few comments related to teaching matters. None of these students said that 3L teaching was bad and 4.8% mentioned that it was good. Only 1.4% mentioned that 3L maths was not procedural.
- There were no striking differences between the comments of HL and OL students or between Compulsory or Chosen students.

# Comments on the Transition from School to Third Level Mathematics

- For the **students who did have difficulty with the transition** the comment mentioned most often was that mathematics was harder at 3L. (24.6%)
- Only 3.4% of these students mentioned that topics were familiar from school.
- 10.2% of students mentioned that mathematics at 3L is not procedural.
- 8.5% mentioned that more help is available at school.
- 6.8% felt that 3L teaching was bad, no student felt that 3L teaching was good.

# Comments on the Transition from School to Third Level Mathematics

- The comments of **OL students who found the transition difficult** were focused on the difficulty of mathematics at 3L (24%) and the perception that mathematics is harder for OL students (19%).
- Many **HL students who found the transition difficult** mentioned that 3L maths is in-depth (18.8%) and that they are required to be more independent (6.3%).
- The main difference between the comments of the **students who had transition difficulties in the compulsory and chosen groups** was that 39% of the chosen group mentioned that mathematics was hard at 3L as opposed to 12% of the compulsory group.

# Comments on the Differences between School and Third Level Mathematics

- 3L Maths is more in-depth, involves more theory or derivations.
- Understanding is emphasised at 3L.
- Maths is harder at 3L.
- Material is more complicated at 3L.
- 3L Maths is more practical or relevant.
- There's not much difference.
- 2L Maths is more procedural, exam-oriented or involves memorisation.
- More independent work is required at 3L.
- Pace is faster at 3L.
- Maths is badly explained at 3L.
- Good teaching at 2L.
- Asking questions is difficult at 3L.
- Large class size at 3L.

# Comments on the Differences between School and Third Level Mathematics

- 293 of the 316 students surveyed (92.7%) commented.
- The theoretical and in-depth nature of 3L mathematics was mentioned by 79 students (25%).
- The fact that 3L mathematics is concerned with understanding was mentioned by 61 students (19.3%).
- 46 students (14.6%) mentioned the procedural nature of the subject at second level.
- 42 students (13.3%) mentioned that 3L mathematics was more difficult than 2L mathematics.

# Comments on the Differences between School and Third Level Mathematics

- All groups of students seemed to appreciate that Maths at third level is in-depth, emphasises understanding, and is less procedural than at second level.
- The **students who had found the transition to third level difficult** are likely to say that maths is difficult at 3L. (21.2%)
- They were also more likely to criticise third level teaching.
- They mention that the pace is faster (11.9%), that mathematics is badly explained at 3L (11.9%).
- They also mention good teaching at school (6.8%).

# What do you like about mathematics at third level?

270 students answered this question. The most popular responses were:

1. The interesting nature of mathematics. (14.2%)
2. Nothing/Not much. (13.3%)
3. The emphasis on understanding. (12.7%)

# Conclusions

- The difficulties and differences mentioned by students seem to fall into two categories: the nature of maths at 3L; teaching methods.
- Students who have difficulties are more likely to mention teaching matters than the students who did not have difficulties.
- Very few students spoke about large classes or social difficulties.
- OL students seem to encounter more difficulties than HL students.
- There were few differences in the experiences of compulsory/non-compulsory students.

# Conclusions

- Many students mentioned (and liked) the emphasis on understanding or the in-depth nature of maths at 3L.
- Some comments:
  1. *'It explains the reasons and concepts of maths a lot more.'* An OL Compulsory student.
  2. *'You learn a lot more in maths lectures than any other subject because so much emphasis is placed on understanding why we're doing what we are doing!'*  
An OL Chosen student.