

Mathematics in Transition Year: *Insights of Teachers from PISA 2012*

Summary Brochure

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Full report and electronic version of this brochure are available on www.erc.ie/pisa

This brochure contains a summary of a recent report of a survey of teachers of Transition Year mathematics that examines the structure and content of mathematics classes in Transition Year, as well as teachers' views on the purposes of mathematics in Transition Year. The survey was carried out in conjunction with the 2012 cycle of PISA (Programme for International Student Assessment). The report was published in advance of the release of the international data for PISA 2012, which will be released in December 2013.

PISA and Mathematics Achievement in Ireland

The OECD's Programme for International Student Assessment (PISA) assesses the skills and knowledge of 15-year-old students in mathematics, reading and science. PISA runs in three-yearly cycles, beginning in 2000, with one subject area becoming the main focus or 'major domain' of the assessment in each cycle. In 2012, mathematics became the major focus of the assessment for the first time since 2003. Student achievement results for PISA 2012 will be available in December 2013.

The performance of students in Ireland in mathematics dropped significantly between 2003 (when mathematics was last a major focus in PISA) and 2009. This decline means that the mathematics achievement of students in Ireland in PISA 2009 was significantly below the OECD average.

Students participating in PISA can be in junior or senior cycle, so it is possible to compare achievement across Third, Transition and Fifth Years. The change in achievement between 2003 and 2009 was not uniform across grade (year) levels in Ireland. While students in Transition Year obtained the highest mean mathematics scores in both years, the largest decline in PISA mathematics between these two cycles occurred at this grade level. While this may be related to the fact that participation in Transition Year has become more widespread, there are also concerns that a less systematic approach to mathematics instruction in Transition Year compared to other grade levels may be contributing to this decline (Shiel, Moran, Cosgrove & Perkins, 2010).

Mathematics in Transition Year

Changes to our education system aimed at improving mathematics standards generally are already underway, with the extension of Project Maths to all post-primary schools, and the publication and subsequent implementation of aspects of the National Strategy to Improve Literacy and Numeracy among Children and Young People 2011-2020 (DES, 2011).

One of the objectives of this strategy is to increase the instruction time made available for literacy and numeracy, and it includes a specific requirement that mathematics is to be taught regularly during Transition Year. Supporting this, the Project Maths Implementation Support Group (2010) and a recent Circular from the Department of Education and Skills (DES, 2011; Circular 0058/0011) have called on schools to provide more innovative teaching and increased mathematics teaching hours in Transition Year, where feasible.

However, aside from these developments, little attention has been paid to the outcomes of teaching and learning mathematics in Transition Year. In addition, there is very little information on the content of mathematics programmes for Transition Year being implemented in schools, how they are delivered, and the amount of time spent delivering them.

PISA 2012 in Ireland: A National Survey of Mathematics Teachers

As part of PISA 2012 in Ireland, teachers of mathematics and mathematics school co-ordinators in participating schools were invited to complete nationally developed questionnaires.

The teaching and learning of mathematics in Transition Year was a focus of the questionnaires, due to the concerns noted above. In total, 1,321 teacher questionnaires and 171 mathematics co-ordinator questionnaires were completed: these represent nationally representative samples, with response rates of 80% and 93% respectively. This report is based largely on the responses of the subgroup of mathematics teachers who had taught mathematics in Transition Year in the previous 18 months (31% of the sample), and mathematics school co-ordinators in schools that offered mathematics in Transition Year (79% of the sample).

Results from the PISA 2012 Survey of Teachers of Mathematics in Transition Year

Purposes of Mathematics in Transition Year

Only about a third of teachers strongly agreed that a purpose of mathematics in Transition Year is to increase students' confidence in their problem-solving ability, and to encourage greater interest in mathematics. Almost 40% disagreed or strongly disagreed that a purpose of mathematics in Transition Year is to familiarise students with the history of mathematics, while just over 20% disagreed or strongly disagreed that a purpose of Transition Year is to encourage students to take Leaving Certificate mathematics at Higher Level.

The Structure of Mathematics Lessons in Transition Year

The vast majority of schools offering Transition Year teach mathematics at this year level regularly, with just under 1% of schools reporting that they do not provide mathematics lessons for Transition Year students. Students in Transition Year are timetabled to have on average 83 hours of mathematics teaching, but receive on average just 84% of these hours. This disparity between hours timetabled and

received may be due to student participation in multi-day activities such as work experience that characteristically take place during Transition Year.

Ability Grouping

The frequency of ability grouping for mathematics classes in Transition Year (44% of schools) is much less prevalent when compared to other year levels (approximately 90% in Third, Fifth and Sixth Years). However, Transition Year provides a unique opportunity to promote the use of mixed-ability teaching approaches in mathematics, given that it is not constrained by a set curriculum and examinations.

Assessment

The majority of mathematics teachers (84%) reported assigning end-of year grades to their students in Transition Year. Teachers tended to assign most importance to traditional forms of assessment, such as tests, assignments, and classroom activities, when arriving at end-of-year grades. However, the outcomes of these assessments did not feature very prominently in allocating Transition Year students to Leaving Certificate mathematics classes, with schools preferring to rely on Junior Certificate examination results instead.

Professional Development for Teachers

Transition Year mathematics teachers reported spending, on average, just under 50 hours engaged in Continuing Professional Development (CPD) for mathematics during the three years preceding the survey, the majority of which had been spent on formal CPD on Project Maths. Participation in CPD related specifically to mathematics in Transition Year was not common – teachers in just 23% of schools that offered mathematics in Transition Year had participated in such CPD in the 18 months preceding the survey. While most teachers surveyed perceived that their undergraduate and postgraduate education had adequately prepared them to teach mathematics at post-primary level, there were significant minorities who did not feel adequately prepared, particularly in the areas of mathematics assessment and mathematics teaching methods.

Summary of Recommendations

The full report contains a set of 14 recommendations. Key ones are:

1. The aims, structure and content of **mathematics in Transition Year should be reviewed** in light of Project Maths, and the **DES Transition Year guidelines** as they relate to mathematics should be **updated**.
2. In teaching mathematics in Transition Year, schools and teachers should focus on **increasing student engagement** with mathematics, and **building confidence** in students' mathematical abilities. Teachers and schools should be supported, for example through CPD, in ensuring that students of **all ability levels** reach their potential in mathematics during this year.
3. Schools and teachers should use Transition Year to **promote student awareness of the importance and relevance of mathematics**. In particular, mathematics teaching should introduce students to **careers in mathematics**, and inform them about the mathematics requirements and content of **third-level courses**. This could be facilitated through a whole-school approach to the subject
4. The **Department of Education and Skills** should expand on the guidelines issued (Circular 0058/0011) regarding increasing mathematics teaching time during Transition Year, and **indicate the minimum amount of mathematics teaching** that all schools should provide across the school year.
5. **Schools should ensure that the teaching of mathematics is prioritised during Transition Year**, when it is likely that students will be engaged in other activities that demand large blocks of time. In the context of whole-school planning, schools should aim to meet the minimum recommended amount of mathematics teaching. Schools should have freedom and autonomy in how they achieve this annual target.
6. The use of **mixed-ability mathematics classes** should be promoted further in Transition Year.
7. The DES and its agencies (NCCA, PDST (Professional Development Service for Teachers)) should support teachers in making use of **resources that emphasise an active, student-led approach to learning** with the aim of fostering student engagement. This could take the form of the development of Transition Units for mathematics that take such an approach.
8. Decisions regarding the **allocation of students to Leaving Certificate mathematics** classes should take into account all available sources of information, including work completed during Transition Year, and any gains in students' confidence and knowledge
9. **Continuing professional development (CPD) for Transition Year should prioritise the teaching and learning of mathematics**. Where possible, this should be offered in the form of online resources and training modules.
10. **Teachers should be supported through CPD in implementing more innovative approaches to the teaching and assessment of mathematics in Transition Year**, that promote the overall aims of encouraging student engagement, enhancing student confidence and improving mathematical understanding, for example, by using mixed-ability teaching methods and assessment for learning strategies.
11. **The Department of Education and Skills should conduct a study at national level that quantifies the cognitive and affective benefits arising from participation in mathematics in Transition Year**. The study should also look at any loss of mathematical skills by students during Transition Year and the effects of such loss on performance in Leaving Certificate mathematics.

Further information on PISA

First international results on PISA 2012 will be published in December 2013. They will include achievement results in mathematics, reading and science, and comparisons of mathematics achievement in 2003 and 2012. They will also include achievement results of computer-based tests of mathematics and reading, while results of a test of computer-based problem-solving will be published in 2014. Background information from education systems, schools and students will be used to contextualise achievement, including how contexts may have changed over time.

National PISA website: www.erc.ie/pisa

OECD's PISA website: www.pisa.oecd.org

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