

## 'I've never thought about teaching it that way!' Improving the teaching and learning of maths through Lesson Study

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### SUMMARY

Students' mathematical experiences influence their educational and career choices. High-quality mathematics teaching is a key factor in students' mathematical achievement and such teaching is influenced by teachers' pedagogical content knowledge and professional development.

By researching teacher learning, Dr Ní Shúilleabháin and colleagues have found that Lesson Study - a Japanese form of teacher collaboration - can develop mathematics teachers' pedagogical content knowledge and support them to incorporate more innovative, engaging classroom practices to improve student learning.

This research has influenced policy and practice in teacher professional development and hundreds of primary and post-primary teachers now take part in Lesson Study in Ireland.

"The extent to which this was successful can be seen in the increasing number of teachers who have become involved in a Lesson Study approach (some in cluster groups of schools) and, particularly, the increasing number of schools/clusters which have showcased its impact on their teaching practice at Maths Counts conferences in recent years"

### RESEARCH DESCRIPTION

Mathematics education is an important societal issue. Many students leave school with insufficient numeracy skills and with an intense dislike of the subject, which negatively effects their future educational and professional prospects. High-quality teaching is a central factor of students' learning. In particular, a teacher's awareness of how to teach mathematics or their 'pedagogical content knowledge' is a key determinant of student's mathematical achievement.

In 2012, a new national post-primary mathematics curriculum known as 'Project Maths' was introduced in Ireland. As part of this curriculum reform teachers were encouraged to introduce new forms of teaching and learning in their classroom and to promote students' engagement in their mathematical learning. Dr Ní Shúilleabháin, a former post-primary mathematics teacher, set out to investigate how teachers could be supported to implement this mathematics curriculum in a way which positively impacted students' learning. For this research she introduced mathematics teachers to Lesson Study, a Japanese form of collaborative teacher professional development.

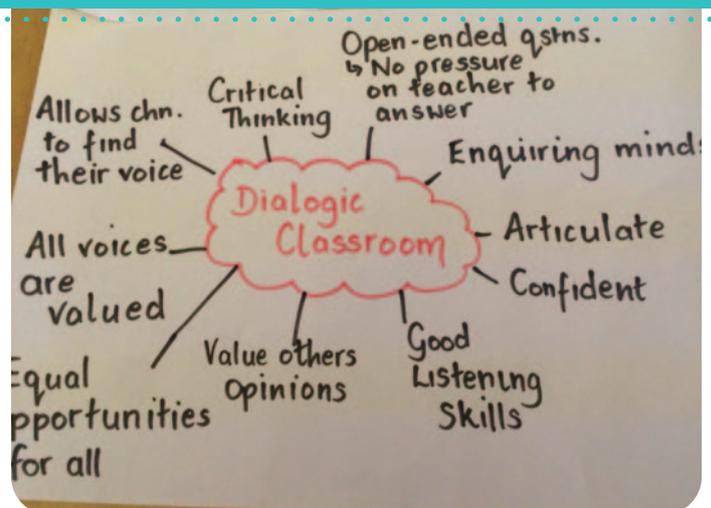


FIGURE 1: Mathematics teacher goals constructed during Lesson Study

By participating in Lesson Study in their schools, mathematics teachers worked to collaboratively design innovative mathematics lessons, trial new teaching ideas, introduce new mathematical strategies, and engage students in problem solving.

Dr Ní Shúilleabháin found that participating in Lesson Study improved teachers' pedagogical content knowledge. Working with her colleague Dr Aidan Seery, Trinity College Dublin, the research further demonstrated that participating in Lesson Study supported teachers to implement the new curriculum and transform their teaching by introducing their students to new and engaging ways of learning mathematics.



FIGURE 3: PDST Lesson Study Workshop - Teachers beginning to outline their Lesson Study goals

## RESEARCH IMPACT

The learning and insight gained from the research conducted by Dr Ní Shúilleabháin and her colleagues has impacted the landscape of teacher professional development in Ireland. Teacher learning in Ireland has previously been characterized by out-of-school, in-service models, which had little impact on teacher practice. Dr Ní Shúilleabháin's research was the first to trial the introduction of Lesson Study in schools in Ireland and demonstrated the potential of this school-based collaborative form of teacher professional development.

Her research findings were initially reported to the National Council for Curriculum and Assessment (NCCA), who then advocated support for this model in the implementation of the new post-primary mathematics curriculum. Her research findings were also shared with the Project Maths Implementation Support Group, an industry-education partnership set to advise on the objectives of the new mathematics curriculum, as a way of supporting teachers to introduce new and engaging ways of teaching mathematics. Dr Ní Shúilleabháin presented her research at numerous international conferences and was the first Irish nominee to the IMPULSE (International Math-teacher Professionalisation Using Lesson Study) immersion programme in Japan. She attended this programme with Dr Anne Brosnan (then Director of the Project Maths Development Team (PMDT)) and participated in Lesson Study in Japanese schools. As part of the Project Maths Development Team's nationwide roll-out of

Lesson Study, Dr Ní Shúilleabháin was invited to train the Lesson Study facilitators to work with mathematics teachers around the country. She presented her Lesson Study research at various teacher and education conferences and shared her Lesson Study resources with practicing mathematics teachers. There are now over 300 post-primary mathematics who are supported in innovating their mathematics teachers teaching through their participation in Lesson Study.

Dr Ní Shúilleabháin was invited to present her work to the Inspectorate section of the Department of Education & Skills and was later invited to conduct a number of Lesson Study workshops for the Professional Development Service for Teachers (PDST). Dr Ní Shúilleabháin worked with the PDST to write a Lesson Study booklet and train Lesson Study facilitators for primary mathematics. Following a successful pilot, there are now over 100 primary teachers participating in Lesson Study across the country.

Based on her research work, Dr Ní Shúilleabháin was invited to be part of the STEM Education Policy Review Group with the Department of Education & Skills and, in this role, works to ensure the necessary policy and support structures are in place to continue to develop the teaching and learning of mathematics in Ireland.

Lesson Study is now conducted by hundreds of primary and post-primary teachers in Ireland, impacting on the mathematics learning of thousands of students around the country. Dr Ní Shúilleabháin's work has influenced policy and practice by investigating and promoting this valuable form of teacher professional development. By encouraging new ways of teaching mathematics, this research may have a potentially transformative effect on the society and economy of Ireland in years to come, as well as improving the lives of the students who can experience more enjoyable and successful ways of learning mathematics.

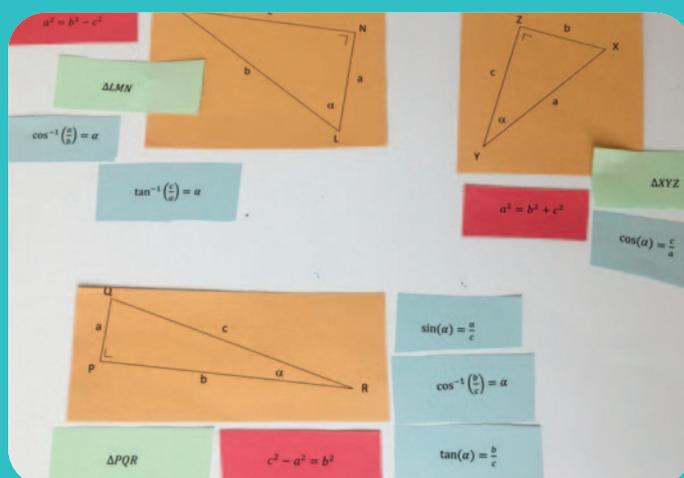


FIGURE 2: Mathematics task for students developed through Lesson Study



## REFERENCES

### Peer-Reviewed Publications

Ní Shúilleabháin, A. (2018). Enacting Curriculum Reform Through Lesson Study in the Irish Post-primary Mathematics Classroom. In M. Quaresma, C. Winsløw, S. Clivaz, J. P. da Ponte, A. Ní Shúilleabháin, & A. Takahashi (Eds.), *Mathematics Lesson Study Around the World: Theoretical and Methodological Issues* (pp. 65-85). Springer International Publishing. doi:10.1007/978-3-319-75696-7\_4

Ni Shuilleabhain, A. & Seery, A.,(2018) Enacting curriculum reform through lesson study: a case study of mathematics teacher learning. 44(2), pp. 222-236. *Professional Development in Education*

Ni Shuilleabhain, A., & Clivaz, S. (2017). Analyzing Teacher Learning in Lesson Study: Mathematical Knowledge for Teaching and Levels of Teacher Activity. *Quadrante*, XXVI(2), 99-126.

Ni Shuilleabhain, A. (2016). Developing mathematics teachers' pedagogical content knowledge in lesson study: case study findings. *International Journal for Lesson and Learning Studies*, 5(3), 212-226. doi:10.1108/IJLLS-11-2015-0036

### Report for Policy-Makers

Ni Shuilleabhain, A. (2015). Lesson Study as a form of in-School Professional Development: Case studies in two post-primary schools. National Council for Curriculum & Assessment: Dublin. <https://www.ncca.ie/media/2136/lesson-study-pd.pdf>

### Publications for Teachers

Ni Shuilleabhain, A & PDST. (2018). Lesson Study Introductory Booklet. Professional Development Service for Teachers: Dublin.

### Grant Information

Postgraduate Ussher Fellowship, Trinity College Dublin (2011-2014): Developing Mathematics Teachers' Pedagogical Content Knowledge through Lesson Study

National Council for Curriculum & Assessment (NCCA) (2012-2013): School funding to support teachers in their participation in the Lesson Study research

UCD SEED Funding, Dissemination and Outputs (2015): Building Mathematics Teachers' Pedagogical Content Knowledge through iterative cycles of Lesson Study

Royal Irish Academy Charlemont Award (2017): Analysing Mathematics Teacher Learning in Lesson Study: Developing A Theoretical Framework