Islands in the stream

Encouraging teacher collaboration in an otherwise solitary profession
\[
\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}}
\]
\[
\cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}}
\]
\[
\tan \theta = \frac{\text{opposite}}{\text{adjacent}}
\]
Islands in the stream
Department of Education & Skills

Teacher Education

Professional Development Service for Teachers (PDST)

National Council for Curriculum & Assessment
- Centralised Curricula

Teaching Council
- Teacher Registration

State Examinations Commission
- Exam Levels: Higher / Ordinary / (Foundation)
Department of Education & Skills

Teacher Education

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National Council for Curriculum & Assessment
  Centralised Curricula

Teaching Council
  Teacher Registration

State Examinations Commission
Enhance students’ learning
Transformative teacher learning

Enhance students’ learning
Research

Policy

Transformative teacher learning

Practice
Research

Transformative teacher learning

Policy

Enhance students’ learning

Practice
Teacher Professional Development

- Mostly in the form of “in-service” held during school day, led by an external facilitator and held outside of the school environment.
- No incentivisation or acknowledgement for any professional development that teachers participate in.
- Policy on regular upskilling for teachers yet to be enacted

(Gilleece et al., 2009; Teaching Council, 2016)
Teacher Professional Development

- Number of days spent in professional development well below the OECD average.
- Very little professional collaboration between teachers.

Countries are ranked in descending order of the median number of days of professional development taken. The interquartile range is the range of days within which the middle 50% of teachers fall.

Source: OECD, Table 3.1d.

(Gileece et al., 2009; TALIS, 2009)
Islands in the stream
Mathematics
Mathematics education in Ireland historically characterised by…

- Low levels of professional collaboration
- Absence of cultural & administrative frameworks to encourage changes to pedagogical practices

(Gileece, 2009; Lyons et al., 2003; Oldham, 2001)
Mathematics education in Ireland historically characterised by...

**TEACHER LEARNING**

- Low levels of professional collaboration
- Absence of cultural & administrative frameworks to encourage changes to pedagogical practices

**CLASSROOM PRACTICE**

- Direct teaching: “chalk and talk”
- Repetitious exercises
- Rote learning
- Teaching to the textbook
- Poor conceptual understanding

(Gileece, 2009; Lyons et al., 2003; Oldham, 2001)
Mathematics education in Ireland historically characterised by...

- Low percentage of students participating in Higher Level Mathematics (average 11%)
- Students give up easily on questions in state examinations
- Low numbers of students in mathematics-based courses at third-level
- Students performing poorly in problem solving and advanced mathematics in international studies

(Department of Education & Skills, 2016; State Exams Commission, 2015)
Post-primary Maths Curriculum Reform

• Revision of the centralised secondary (ages 11-18) curriculum to emphasise conceptual understanding and problem solving:
  “Project Maths”

• Phased introduction with 24 pilot schools (2010) and national roll-out (2012)

• 10 in-service days of professional development offered to all mathematics teachers in the country
Project Maths

• No textbooks, no examination guide
• Teachers needed to learn to work together
\(x^2 - 2x - 24\)
1. \[x^2 - 2x - 24\]
   \[(x - 6)(x + 4)\]

2. \[x^2 - 2x - 24\]
   \[x^2 - 2x + 1 - 25\]
   \[(x - 1)^2 - 25\]

3. \[x^2 - 2x - 24\]

4. \[x^2 - 2x - 24\]
Problems multiply as our students struggle with maths

Teachers say that Project Maths, the new second-level syllabus, is "too difficult, too vague and too long". reports Kim Bielenberg.

New Project Maths course causes multiple divisions

Critics claim the syllabus doesn't add up. Kim Bielenberg reports on the pluses and minuses.

Syllabus for maths does not add up for teachers

Pupils: READY for 240 hours of work over three years. (Stock image)
Curriculum Reform

• Consistently demonstrated to fail
• Poor track record as instrument for educational improvement
• Results in reduced teacher motivation, morale & collegial interaction

(Fung, 2000; O’Shea & Leavy, 2013)
Curriculum Reform

• Consistently demonstrated to fail
• Poor track record as instrument for educational improvement
• Results in reduced teacher motivation, morale & collegial interaction

Project Maths Reform

• Follow-up report found no change to classroom practices:
  • Drill and practice
  • Copying from the board
  • Dependence on text-books

Department of Education & Skills
National Council for Curriculum & Assessment

(Jeffes et al., 2012, 2013)
Curriculum Reform

• Grass-roots initiatives may look good in theory but often have little impact on classroom practices

(Fullan, 1994)
Curriculum Reform

• Simultaneous mandated but school-centric initiatives
• Teachers can interpret and action reform according to their own goals as a school community
• More successful & sustainable reform

(Clement, 2015; Penuel et al. 2007)
How can we collaborate as teachers to make mathematics more understandable and enjoyable for our students?
Formulate Goals & Study Curriculum

Reflect on research lesson

Plan research lesson

Conduct research lesson

(Lewis et al., 2009)
Curriculum Reform

Teachers should be encouraged to collaborate with their peers (Fullan & Hargreaves, 1992)

Most significant learning for teachers occurs in enacting a revised curriculum in the classroom (Remillard, 1999, 2000)

Teachers should reflect on new approaches relevant to their particular school context, students & school culture (Vescio et al., 2008)

Teachers should be encouraged to focus on student thinking (Mason, 1998)

Teacher norms and identities may require some transformation and this can occur through school-based communities (Lieberman, 2009)
Curriculum Reform & Lesson Study

- Teachers should be encouraged to collaborate with their peers (Fullan & Hargreaves, 1992)
- Most significant learning for teachers occurs in enacting a revised curriculum in the classroom (Remillard, 1999, 2000)
- Teachers should reflect on new approaches relevant to their particular school context, students & culture (Vescio et al., 2008)
- Teachers should be encouraged to focus on student thinking (Mason, 1998)
- Teacher norms and identities may require some transformation and this can occur through school-based communities (Lieberman, 2009)

(Lewis & Takahashi, 2013; Murata, 2011; Ponte, 2012)
Lesson Study in Ireland

Early 2000’s

• Suggested as a way to bridge the research-practice gap in Ireland (Kelly & Sloane, 2003)

• Focus of National Council of Curriculum & Assessment research report into mathematics education (Conway & Sloane, 2005)

• Introduced in primary Initial Teacher Education circa 2006 (Corcoran, 2007)
Lesson Study in Ireland

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• Introduced in primary Initial Teacher Education circa 2006 (e.g. Corcoran, 2007)

2012

• 24 curriculum reform pilot schools requested to engage in lesson study as a compulsory form of professional development (Brosnan, 2014)
• National Council for Curriculum & Assessment supported research into school-based lesson study in two case-study secondary schools (Ni Shuilleabhain, 2015)
School-Based Lesson Study in Ireland

Participating in Lesson Study supported teachers in enacting the new curriculum since they began to:

• Emphasise the social dimensions of learning
• Act as facilitators of learning
• Design & incorporate contextualised content

(Ni Shuilleabhain & Seery, 2017)
Increased elements of Pedagogical Content Knowledge in Teachers’ conversations

Doone: Features of KCS and KCT over successive cycles

% of Teacher Conversations

Lesson Study Cycle
Mathematical Knowledge for Teaching and Levels of Teacher Activity

Mathematical Knowledge for Teaching
(Ball, Thames & Phelps, 2008)

Common Content Knowledge (CCK)
Horizon Content Knowledge (HCK)
Specialized Content Knowledge (SCK)
Knowledge of Content and Students (KCS)
Knowledge of Content and Teaching (KCT)
Knowledge of Content and Curriculum (KCC)

Levels of Teacher Activity
(Margolinas, Coulange & Bessot, 2005)

Values and conceptions about learning and teaching
The global didactic project
The local didactic project
Didactic action
Observation of students' activity
Student lens

(Ni Shuilleabhain & Clivaz, 2017; Clivaz & Ni Shuilleabhain, 2019)
Mathematical Knowledge for Teaching expressed according to Levels of Teacher Activity over one cycle of lesson study

(Ni Shuilleabhain & Clivaz, 2017; Clivaz & Ni Shuilleabhain, 2019)
School-based Lesson Study in Ireland

Participating in Lesson Study over one academic year:

- Supported the development of mature teacher professional communities that were sustained over six years later (Grossman et al. 2001)
- Provided teachers with mechanisms to continually critically analyse and reflect on their pedagogical practices

(Lewanowski-Breen, 2019)
Sustainability of school-based Lesson Study in Ireland

Participating in Lesson Study over one academic year:

- Supported the development of mature teacher professional communities that were sustained over six years later (Grossman et al., 2001)
- Provided teachers with mechanisms to continually critically analyse and reflect on their pedagogical practices
- Influenced other teachers to begin collaborating
School-based Lesson Study in Ireland - Research findings

- Teachers began to enact the curriculum in their classrooms
- Teachers utilised and increased their knowledge
- Lesson study was not seen as an “add on” but an integral part of their practice
- Voluntary capacity of teachers highlighted as an important element of their own learning
- Role of the school principal important in encouraging teachers to engage in such collaborative work
“Based on this evidence, the NCCA was in a position to promote and support the adoption by the PMDT of a Lesson Study model of teacher professional development in planning for the period 2014-2016.”
<table>
<thead>
<tr>
<th>ACADEMIC YEAR</th>
<th>SECONDARY TEACHERS</th>
<th>SCHOOLS</th>
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</tr>
<tr>
<td>2018-2019</td>
<td>113</td>
<td>56</td>
</tr>
</tbody>
</table>
Lesson Study in Ireland

74 primary teachers involved in school-based Lesson Study since 2016
Lesson Study & Structured Problem Solving

Two wheels of the same cart
Structured Problem Solving

Discuss & compare solutions

Ideas / questions / further problems

(Hino, 2007; Takahashi, Lewis & Perry, 2013)
Given: ABCD is a quadrilateral.
Points A, B, C, D are on circle P, which has centre R.
Line K contains the points A, R and C.
Line L contains the points D, R and B.
Prove: ABCD is a rectangle

Teaching Mathematics through Problem Solving

1. Present the problem
2. Students attempt to solve the problem
3. Students present their solutions – facilitated by the teacher
4. Teacher highlights and summarises learning from the presentations and class discussion
Research

Transformative teacher learning

Policy

Enhance students’ learning

Practice
Research

Initial Teacher Education

Transformative teacher learning

Enhance students’ learning

Practice

Policy
Initial Teacher Education

Learning how to learn to teach (Hiebert et al., 2007):

Skill 1: Specifying the learning goals for a lesson

Skill 2: Conducting empirical observations of teaching & learning

Skill 3: Constructing hypothesis about the effects of teaching on pupil learning

Skill 4: Using analysis to propose improvements in instruction
Initial Teacher Education & Lesson Study

Learning how to learn to teach (Hiebert et al., 2007):

✓ Skill 1: Specifying the learning goals for a lesson

✓ Skill 2: Conducting empirical observations of teaching & learning

✓ Skill 3: Constructing hypothesis about the effects of teaching on pupil learning

✓ Skill 4: Using analysis to propose improvements in instruction

Lack of coherence in the implementation of Lesson Study in ITE across institutes and countries.

(Larrsen et al., 2018; Ponte, 2017)
Suggested structural features of Lesson Study in Initial Teacher Education

• Engagement of student teachers across the lesson study cycle
• Defined roles of university & mentor teachers
• Lesson study conducted in conjunction with university modules to bridge the practice-theory gap

(Ni Shuilleabhain & Bjuland, 2019)
Lesson Study & Initial Teacher Education in Ireland

- Eight programmes (two primary and six secondary) across ten providers include Lesson Study
- Non-uniform implementation across programmes
- No formal relationships with in-school teachers
- Require more established relationships between institutes and schools
- Require more time for subject specific pedagogy
TOP DOWN
Mandated curriculum & professional development

BOTTOM UP
Teacher interpretation through Lesson Study
TOP DOWN
Mandated curriculum & professional development

BOTTOM UP
Teacher interpretation through Lesson Study

But has it been a success?
More research required on classroom, local and national level.
Policy & structures that recognise and acknowledge teachers’ commitment to learning.
Transformed & shared classroom culture to benefit students’ learning
Research

Policy

Practice
How can we teach maths to prepare our young people to be curious and engaged?
How can we teach to prepare our young people for the challenges of the world?
Dank je wel

Go raibh maith agaibh
(Thank you)

Questions?
Islands in the stream