Lesson Study in Teacher Preparation: Driving Inquiry and Teacher Noticing

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Lesson Study in Initial Teacher Education

- Constrained time
- No single widely-used approach
- Adapted Lesson Study:
  - Microteaching Lesson Study (Cajkler et al., 2013; Fernandez, 2005)
  - Lesson plan study (Cavey & Berenson, 2005)
  - Shortened lesson study cycle (McMahon and Hines, 2008)
- Traditional (formal) Lesson Study approach:
  - Majority of studies complete lesson study within school placement (Cajkler and Wood, 2018; Chassels and Melville, 2009)
- Our unique context: Formal lesson within an elective outside school placement

Lesson Study Research: 2008-2018

Year	Participants	Theme	Mathematics Focus
2008	26 students 5 groups	Foundational ideas in statistics	(i) The mode (ii) Graphical representations (iii) The arithmetic mean (iv) The median (v) Distribution
2009	26 students 5 groups	Informal Inference	Informal Inference
2010	21 students 4 groups	Developing ideas in Data	(i) Data is the early years (ii) The mean (iv) Data comparison and sampling (v) Distribution and Inference
2011	22 students 4 groups	Foundational ideas in Algebra	(i) Algebra is the early years (ii) Functions (iii) Equality (iv) Variables
2012	23 students 5 groups	Foundational ideas in Geometry	(i) Geometry in the early years (ii) Polygons (iii) Symmetry (iv) Quadrilaterals (v) 3d shapes: Pyramids and Prisms
2013	25 students 5 groups	Algebra and Probability	(i) Growing patterns, (ii) Describing likelihoods (iii) Comparing and explaining likelihoods (iv) Ordering likelihoods, (v) Sampling
2014	7 students 2 groups	CLIL: Teaching through Irish	(i) Symmetry (ii) Polygons (iii) Nets and 3D shapes (iv) 3d shapes: Pyramids and Prisms
2015	20 students 5 groups	Early number concepts	(i) Counting, Subitising, Cardinality, (ii) Creating sets (iii) Comparing and ordering (iv) Matching numeral to set (v) part-part-whole relationships, partitioning
2016	25 students 5 groups	Data modelling in infant classroom	(i) Data inscription, (ii) Selection of attributes, (iii) Data representation, (ii) (iv) informal inference
2017	25 students 5 groups	Measures in the Early Years	(i) Length I, (ii) Length II, (iii) Time, (iv) weight, (v) capacity
2018	26 students 5 groups	STEM Education	(i) Problem, Plan, Data, (ii) Comparing Distributions, (iii) Relationships between variables, (iv) Relationship between area, perimeter and volume, (v) Area of irregular shapes

Theoretical perspectives

Inquiry-based learning: Learning in and from practice (Ball & Cohen, 1999; Hiebert, Gallimore & Stigler, 2009; van Es & Sherin, 2002)

The classroom is a place where knowledge is transmitted through various processes, in particular through situations that contextualize knowledge and through interactions about this knowledge amongst people (teacher and students) who act within and on these situations. Thus situated at an intermediate position between the global educational system and the microlevel of individual learning processes, the **classroom teaching situation constitutes a pertinent *unit of analysis for* didactic research in mathematics, that is, research into the ternary didactic relationship which binds teachers, students and mathematical knowledge**.

Laborde & Perrin Glorian (2005)

Year	# Participants	Theme	Mathematics Focus
2016	25 students 5 groups	Data modelling in infant classroom	(i) Data inscription, (ii) Selection of attributes, (iii) Data representation, (ii) (iv) informal inference

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The role of perceptual similarity, context, and situation when selecting attributes: considerations made by 5–6-year-olds in data modeling environments

Aisling Leavy[1] · Mairead Hourigan[1]

Abstract Classroom data modeling involves posing questions, identifying attributes of phenomena, measuring and structuring these attributes, and then composing, revising, and communicating the outcomes. Selecting attributes is a fundamental component of data modeling, and the considerations made when selecting attributes is the focus of this paper. A teaching experiment involving 2 teacher educators and 25 pre-service teachers (PSTs) was carried out with 24 young children (5–6-year-olds) as part of a 4-day data modeling investigation. Although perceptual features of the data influenced initial approaches to attribute selection, considerations of the problem situation influenced a shift from the perceptual and towards consideration of attributes such as taxonomy, habitat, behavior, and diet. Expertise in the data context (animal kingdom) and ability to collaborate and negotiate within groups supported children in their ability to switch attributes, attend to multiple situations presented by the problem, and modify and extend their categorizations of data.

Keywords Data modeling · Attribute selection · Statistical inquiry · Young children · Teaching mathematics · Statistics · Elementary education

1 Introduction

Advancement of modern technologies has resulted in children gaining access to data at younger ages. Consequently, there arises the need to support the development of young children's statistical reasoning and thinking. Indeed, recent research exploring data modeling

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Educational Studies in Mathematics

Year	# Participants	Theme	Mathematics Focus
2014	7 students 2 groups	CLIL: Teaching through Irish	(i) Symmetry (ii) Polygons (iii) Nets and 3D shapes (iv) 3d shapes: Pyramids and Prisms

Unpacking dimensions of immersion teacher educator identity

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Inadequate teacher preparation for immersion programs remains a challenge. While there is a significant dearth of research on teacher development in immersion education, research focusing on immersion teacher educators (ITEs) is even more scant. Using self-study methodology, this study explores the professional learning and experiences of three teacher educators (TEs) as they construct new professional identities as ITEs as part of engagement in Lesson Study. The paper particularly focuses on two Mathematics teacher educators (MTEs) who were *newcomers* to the immersion education setting. A *community of practice* (CoP) framework was utilised to provide insights into what Vygotsky (1987) terms the twisting path of all three TEs as they engaged in the CoP. Critical moments of defending content as priority, negotiating an integrated space, and becoming immersion-responsive were revealed. CoP played a vital role in facilitating new professional identities and illuminates in multiple ways the exclusive and complex process of becoming an ITE.

Keywords: immersion teacher educator (ITE), professional identity, initial teacher education, professional development, self-study, community of practice (CoP)

1. Introduction

In most international contexts, a qualification in elementary education is deemed sufficient to teach in an immersion setting. Inadequate teacher preparation for immersion programs remains a challenge. These challenges are further compounded by the inadequate supply of immersion teacher educators (ITEs) with the mandatory linguistic and cultural competencies and associated pedagogical practices fundamental to immersion. Our understandings of immersion education and ITE development in the Republic of Ireland is similar to that in many other countries. There is a significant dearth of research "on a wide variety of top-

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Theoretical perspectives

Teacher knowledge perspectives

- Multiple knowledge domains support the teaching of mathematics (Shulman 1986, Ball et al., 2008), including
  - ➢ Subject matter knowledge, pedagogical understandings, curricular knowledge, horizon knowledge ....
- Examining knowledge in practice (Cochran-Smith and Lytle, 1999)

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

Year	# Participants	Theme	Mathematics Focus
2015	20 students 5 groups	Early number concepts	(i) Counting, Subitising, Cardinality, (ii) Creating sets (iii) Comparing and ordering (iv) Matching numeral to set (v) part-part-whole relationships, partitioning

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Using lesson study to support knowledge development in initial teacher education: Insights from early number classrooms

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Early Childhood Education Journal

Using Lesson Study to Support the Teaching of Early Number Concepts: Examining the Development of Prospective Teachers' Specialized Content Knowledge

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Theoretical perspectives

'Noticing' in Teacher Education:

- Challenges of identifying noteworthy incidences (Erickson, 2010)
  - Tendency to focus on superficial aspects of teaching
  - Particularly difficult for student teachers
- Lesson Study has potential to provide a framework to support noticing (Murata 2011; Lamb and Yuk Ko 2016; Cajkler and Wood 2018)
  - Observation of video promotes this development (Van Es and Sherin, 2002)
- Van Es and Sherin (2002, p. 573) identify three aspects of noticing:
  - ✓ identifying what is important or noteworthy about a classroom situation;
  - ✓ making connections between the specifics of classroom interactions and the broader principles of teaching and learning they represent; and
  - ✓ using what one knows about the context to reason about classroom events

View this piece of classroom video ……

[Transcript is available]

BUYING A PUPPET

THE JUNIOR INFANT TEACHER WANT TO BUY A PUPPET FOR HER CLASS.

CAN WE HELP HER IDENTIFY THE PUPPET THAT APPEARS MOST OFTEN IN THE STORY?

Reasoning about the data presented on graphs ….

View Video exerpt #1

View Video exerpt #2

Much of what they (teachers) have to learn must be learned in and from practice rather than in preparing to practice

Ball & Cohen (1999, p.10)