# Investigating Predictors of Mathematics Attainment among Children Attending Multi-grade Classes in Small Schools in Ireland

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- Support: The Teaching Council and Mary Immaculate College

- Date Source: Growing Up in Ireland

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# Objectives of this presentation

- To share findings about mathematics attainment in multi-grade classes in small schools in Ireland
- To demonstrate predictors of mathematics attainment among children in multi-grade settings in primary schools
- To highlight three recommendations arising from the study

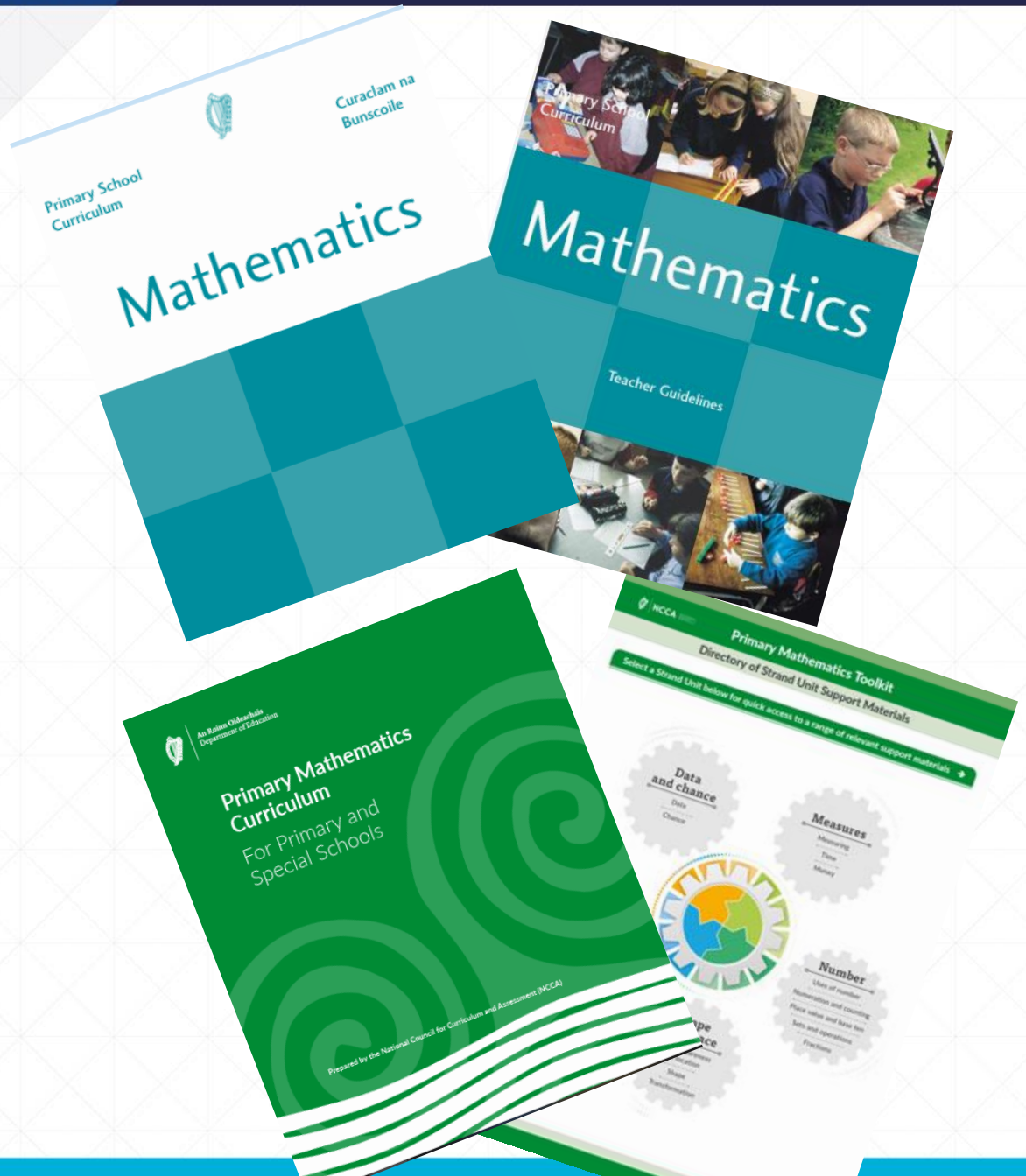
# Multi-grade classes

- Multi-grade teaching is defined as where two or more grade groups are taught together by a teacher in the same classroom (Quail & Smyth, 2014; Mulryan-Kyne, 2007; Veenman, 1995)
- A single teacher has sole responsibility for teaching two or more grades or classes simultaneously (Berry & Little, 2006).

# Where do multi-grade settings exist?

# Multi-grade education in Ireland

- 22.8% of primary-school children (CSO, 2025)
- 24.5% of mainstream classes (CSO, 2025)
- 42% of primary schools have 4 or fewer teachers (DE, 2024)

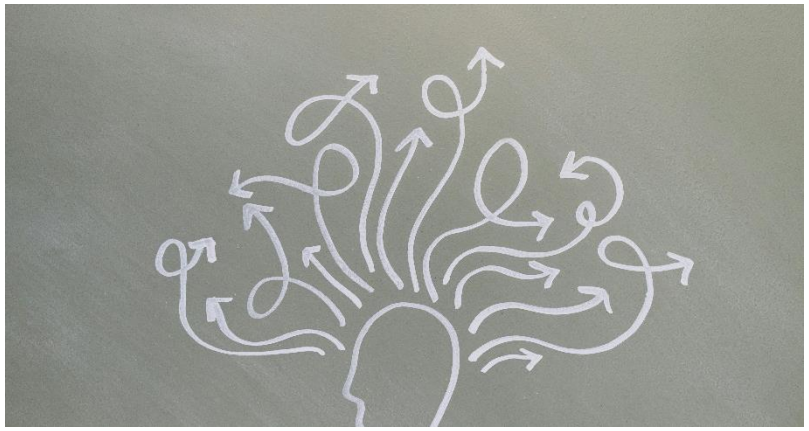

Curaclam na Bunscoile
Primary School Curriculum
Mathematics
Primary School Curriculum
Mathematics
Teacher Guidelines
An Roinn Oideachais
Department of Education
Primary Mathematics Curriculum
For Primary and Special Schools
Prepared by the National Council for Curriculum and Assessment (NCCA)
NCCA
Primary Mathematics Toolkit
Directory of Strand Unit Support Materials
Select a Strand Unit below for quick access to a range of relevant support materials
Data and chance
Measures
Number

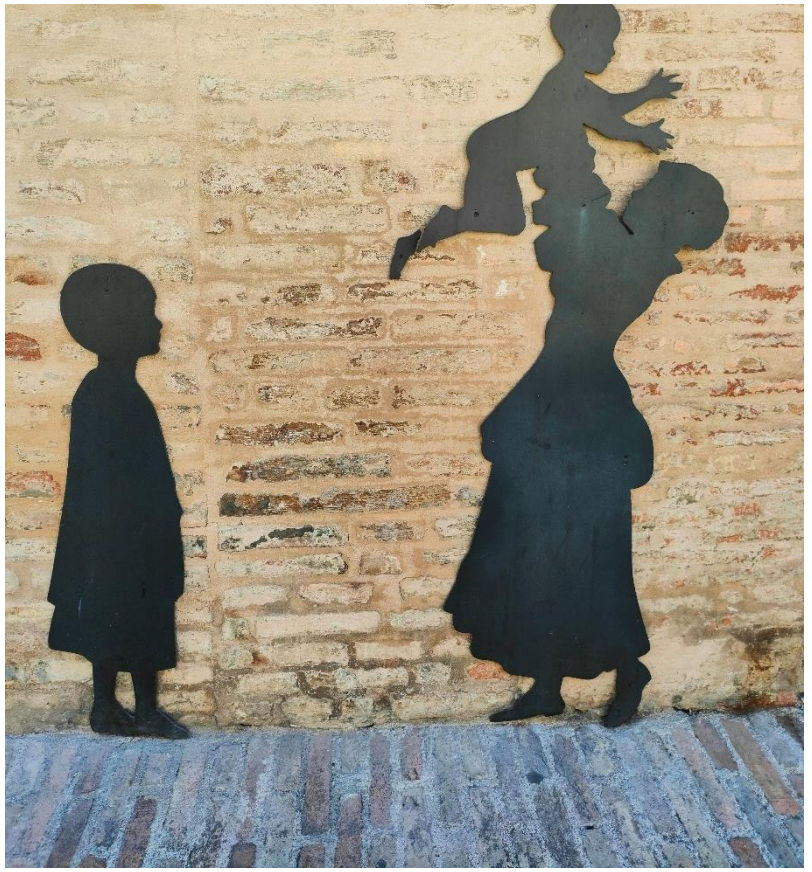

An Chomhairle Mhúinteoireachta
The Teaching Council
CÉIM
Céim: Standards for Initial Teacher Education
In accordance with Section 38 of the Teaching Council Acts, 2001-2015
October 2020
Cosán
Framework for Teachers' Learning
March 2016


Our Rural Future
Rural Development Policy 2021-2025

# Attainment in multigrade classes

- Children are not held back by being grouped with children in a younger grade level (Adams, 1953)
- Veenman (1995) found no evidence of a difference in attainment and this was later challenged by Mason and Burns (1996)
- Students' mathematics outcomes may suffer in multigrade classes (Veenman, 1996)
- There is a negative, although non-significant effect on student mathematics outcomes for students in multigrade classes (Russell et al., 1998)
- Students in a multigrade classroom experience consistently small, negative effects (Mariano & Kirby, 2009)
- Students are not harmed by being educated in a multigrade setting or in a school that offers multigrade classes (Thomas, 2012)
- Evidence of compositional effects with advantages for lower grade levels in the presence of older peers (Borbely et al., 2021)
- No significant difference between single grade and multigrade mathematics scores (Eivers et al., 2010)





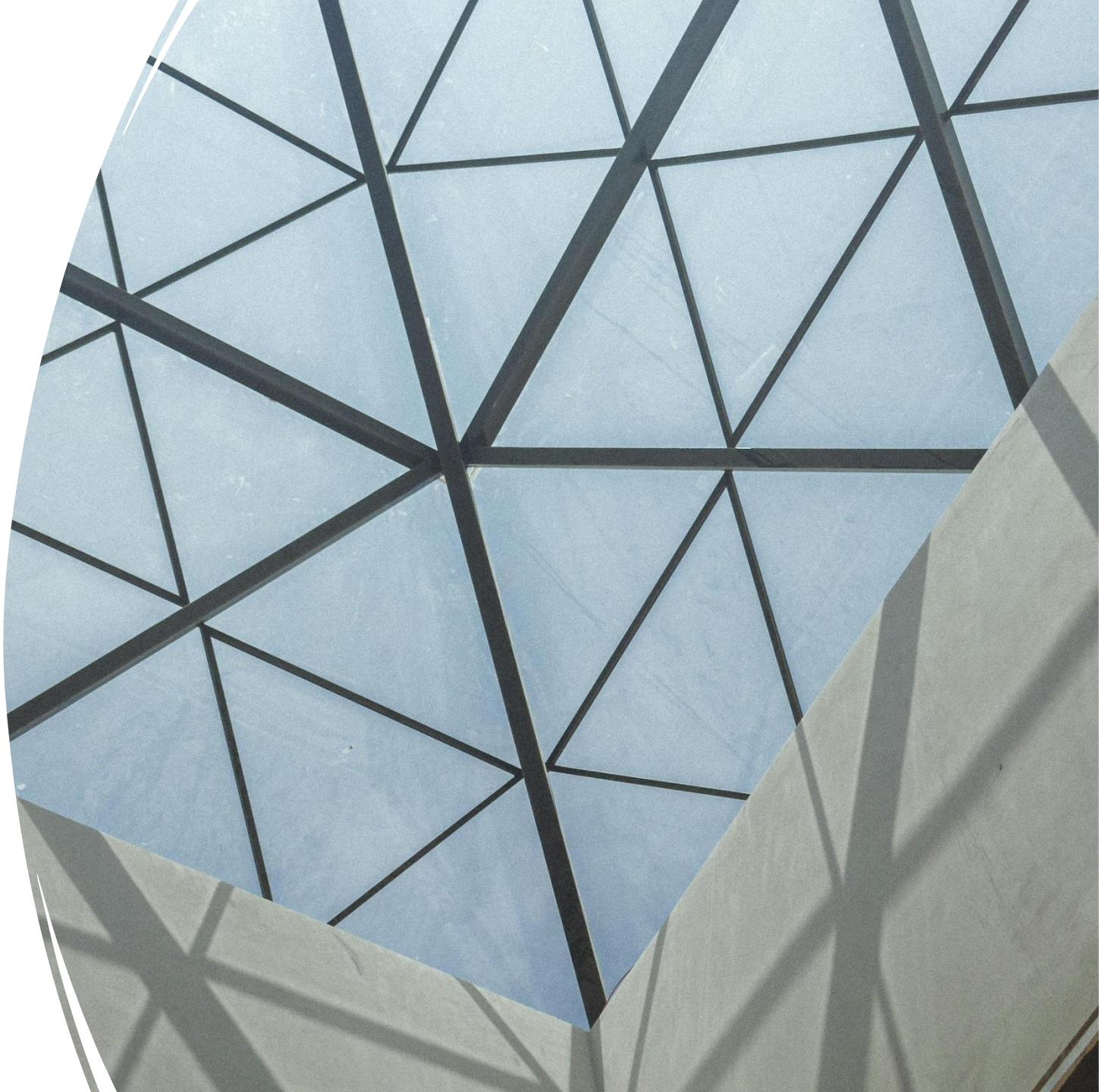
# Factors influencing mathematics outcomes

# Research questions

What differences, if any, exist between the mathematics outcomes of children in multi-grade classes in small schools compared to their single-grade counterparts?

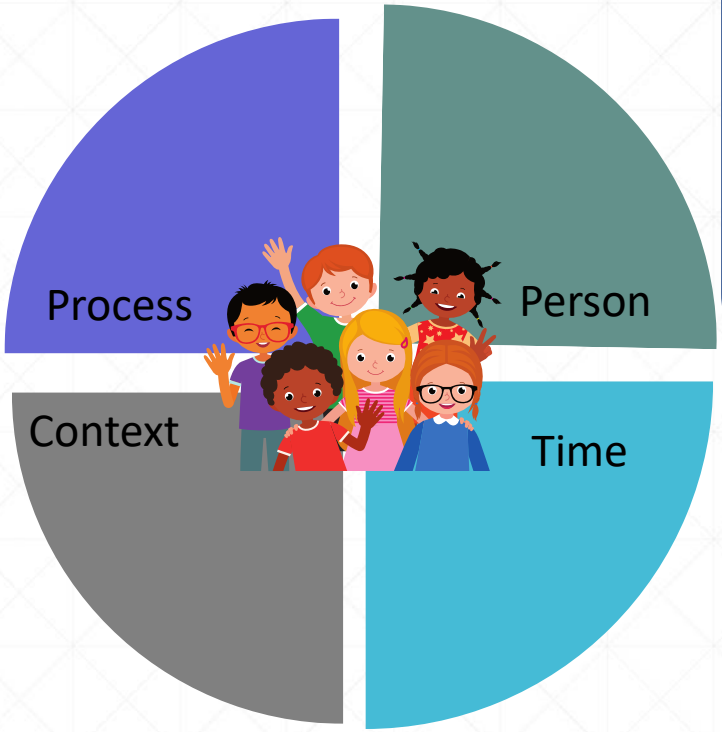
What factors influence the mathematics outcomes of children in multi-grade classes in small schools?

# Choosing a framework



Presence at school
Bullying
Instructional time for mathematics
Frequency of individual, pair and group work
Differentiation
Use of computers

Boy/Girl
SEN
Reading scores
Attitudes towards mathematics
Internalising problems score
Prior attainment *



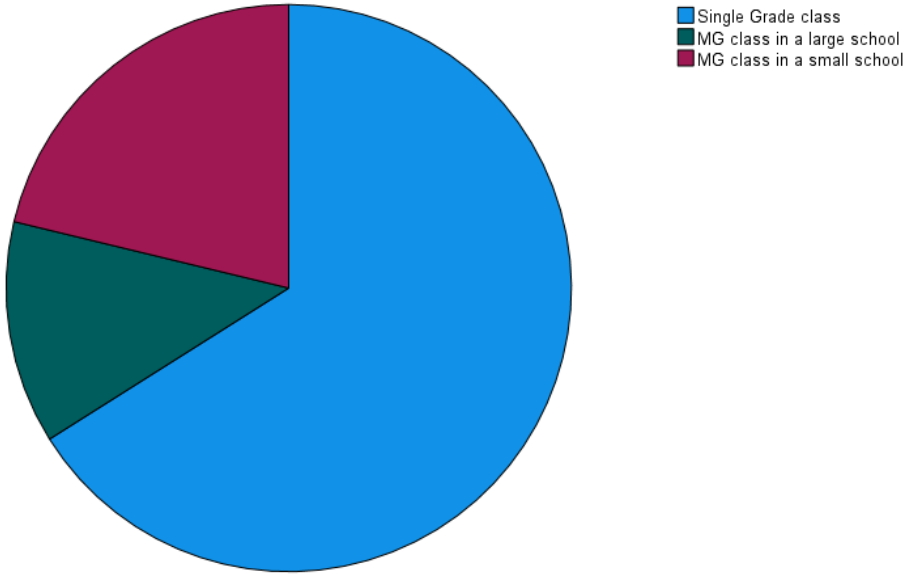

School status
School gender mix
Teacher experience
Principal experience
Adequacy of maths facilities and learning support provision
Selection criteria

Chronosystem
Age 9
Age 13

The bio-ecological framework (Bronfenbrenner & Morris, 2006)

# Data source

- ‘98 cohort of Growing Up in Ireland
- Data from wave 1 and wave 2
- Drumcondra Mathematics Assessment Scores
- Study child questionnaire
- Primary caregiver questionnaire
- Teacher questionnaires
- Principal questionnaire




Growing Up in Ireland
National Longitudinal Study of Children

# Quantitative approach

SPSS

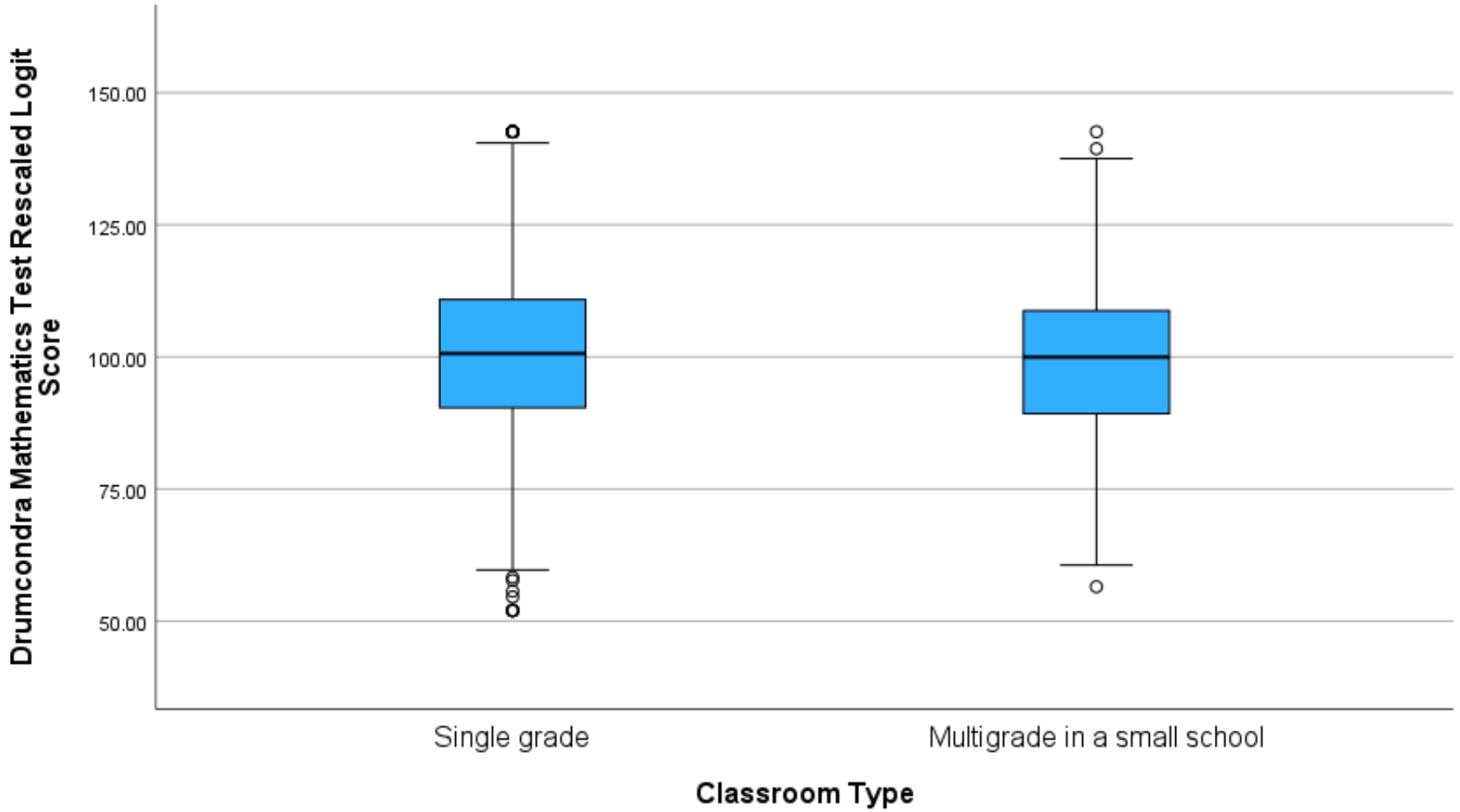
Descriptive Statistics

Tests of comparison

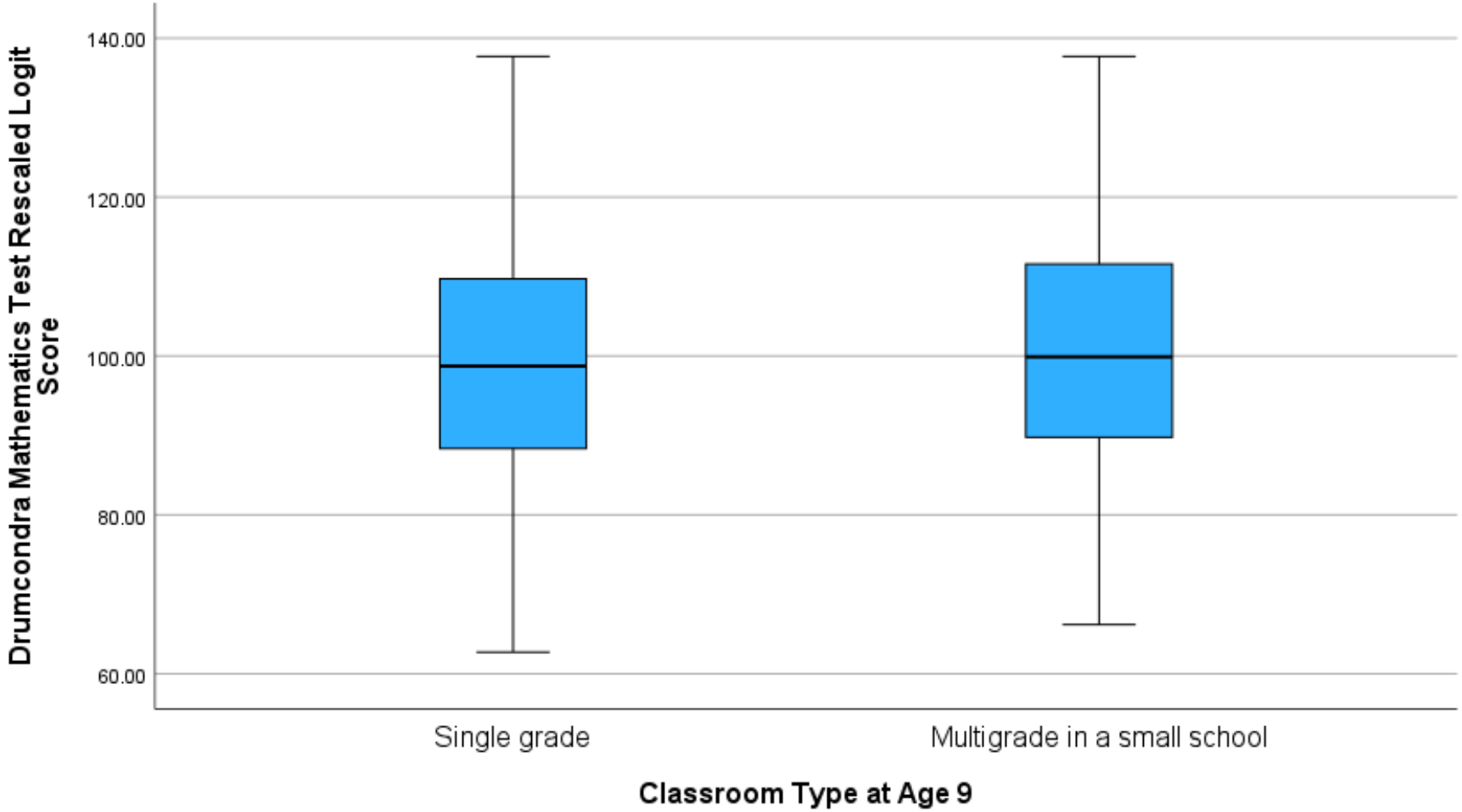
Tests of association

Multi-level modelling

# Mathematics scores at age 9



# Mathematics scores at age 13



# Mathematics Attainment Results (1)

- No evidence of a statistically significant difference between mathematics scores of children who attended multi-grade classes in small schools and children in single-grade classes at age nine.

  0.333 (95% CI, -0.584 to 1.251), $p$ = .476

- 13-year-old children who attended multi-grade classes in small schools at age nine attained scores which were statistically significantly higher than those of their counterparts who attended single-grade classes at age nine.

  1.244 (95% CI, 0.20 to 2.29), $p$ = .02

# Mathematics Attainment Results (2)

- Changes from age nine and age 13- Percentile rankings
- Attending a multi-grade class was not a statistically significant predictor of change in percentile ranking from age 9 to age 13

  0.724 (95% CI, -2.282 to 3.720), $p$ = .636.

# Mathematics Attainment Results (3)

Mathematics attainment of girls and boys in multi-grade classes

- At age nine, girls in multi-grade classes attained lower mathematics scores than boys in multi-grade classes. Scores were almost two points lower and these were statistically significant

  -1.92 (95% CI, -3.38 to -0.45), p = .010

- (Similar result evident in single-grade classes)
- At age 13, there was no evidence of a statistically significant difference when the scores of girls were compared to the scores of boys

  -1.37 (95% CI, -3.116 to .381), *p* = .125.

- (Different result evident in single-grade classes)

# Mathematics Attainment (4)

There were statistically significant differences between the proportions of boys and girls who attained scores in the top quintile from multi-grade classes and single-grade classes.

# Variables included in the model

| Age 9 | Multi-grade | Single-grade |
|---|---|---|
| Intercept | 84.19 | 88.08 |
| Girl | -1.91 * | -1.87 ** |
| Special educational need or condition | -5.83 ** | -5.00** |
| Reading Score Q2 | 6.31** | 6.95 ** |
| Reading Score Q3 | 14.10** | 11.55 ** |
| Reading Score Q4 | 16.96 ** | 15.00 ** |
| Reading Score Q5<br>Ref: Reading Score Q1 | 21.79 ** | 21.41 ** |
| Liking maths always | 3.79 ** | 2.38** |
| Liking maths never<br>Ref: Liking maths sometimes | 1.35 | -2.31 ** |
| Internalising symptoms | -.15 | -.30** |

# Summary

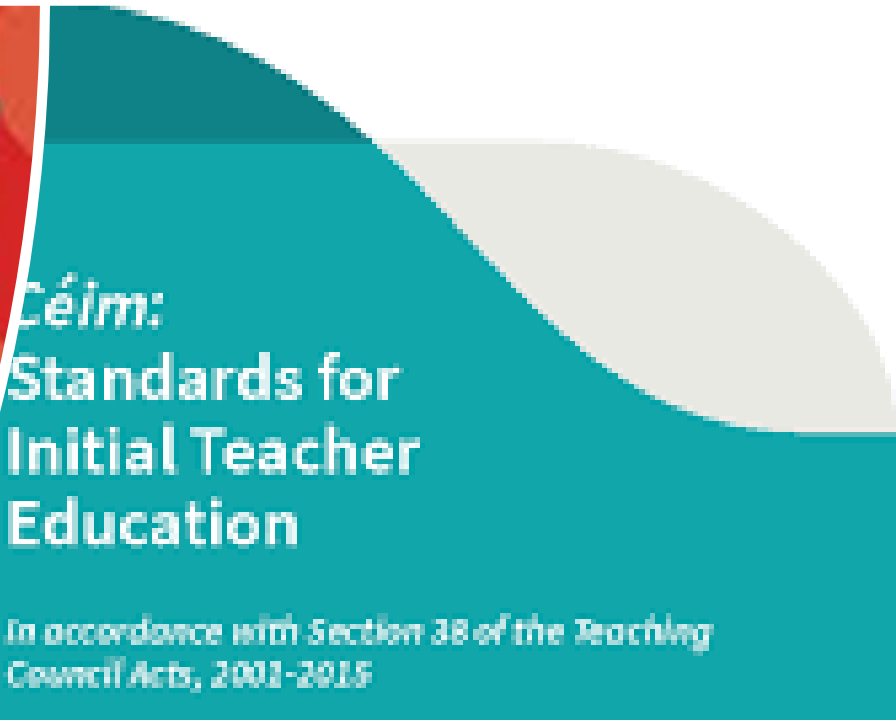
- There are differences in attainment
- Positive outcomes are evident for children in multi-grade classes
- There are further opportunities for development when focusing on groups within multi-grade classes
- Many of the positive predictors of mathematics attainment are not fixed characteristics

# Recommendations

- Support for teachers to aid curriculum enactment
- Emphasis on educational opportunities of small schools rural development policy
- Focus in teacher development policy documents







# Thank you.
# Go raibh maith agat.

- Questions welcome