Growing Up in Ireland
National Longitudinal Study of Children




13th Annual Research Conference 2021

An exploration of the mathematics outcomes of 9-year-old children in multigrade classrooms in small schools.

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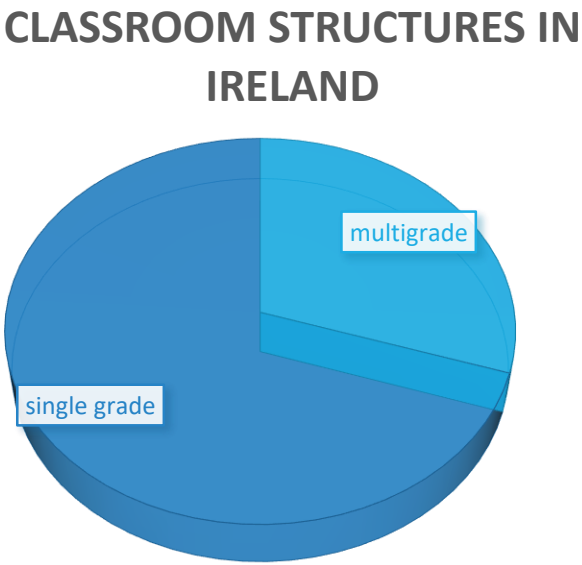
Introduction

- Multigrade teaching refers to settings where a single teacher has sole responsibility for teaching two or more grades or classes simultaneously (Berry & Little, 2006).



Multigrade Education

- Children are not held back by being grouped with children in a younger grade level (Adams, 1953)
- Students are not harmed by being educated in a multigrade setting or in a school that offers multigrade classes (Thomas, 2012)
- Students in a multigrade classroom experience consistently small, negative effects (Mariano & Kirby, 2009)

Mathematics outcomes in multigrade classes

- 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, Rowe & Hill, 1998)
- No significant difference between single-grade and multigrade mathematics scores in NAMER 2009 (Eivers, Close, Shiel, Millar, Clerkin, Gilleece & Kiniry, 2010)
- Being in a multigrade classroom had little impact. However, girls in classes with older children scored significantly lower in maths than those in single grade classes in the GUI 9 year old cohort. (Quail & Smyth, 2014)

Research aims

- To investigate if there is a difference between the mathematics outcomes for children in multigrade classes in small schools in Ireland compared with their single-grade counterparts

- To establish what factors influence the mathematics outcomes of children in multigrade classes in small primary schools in Ireland

Data and Methodology

- GUI Child Cohort (‘98) Anonymised Microdata Files (AMF)

Wave 1

- 7109 children of whom 1253 were in multigrade classes in small schools

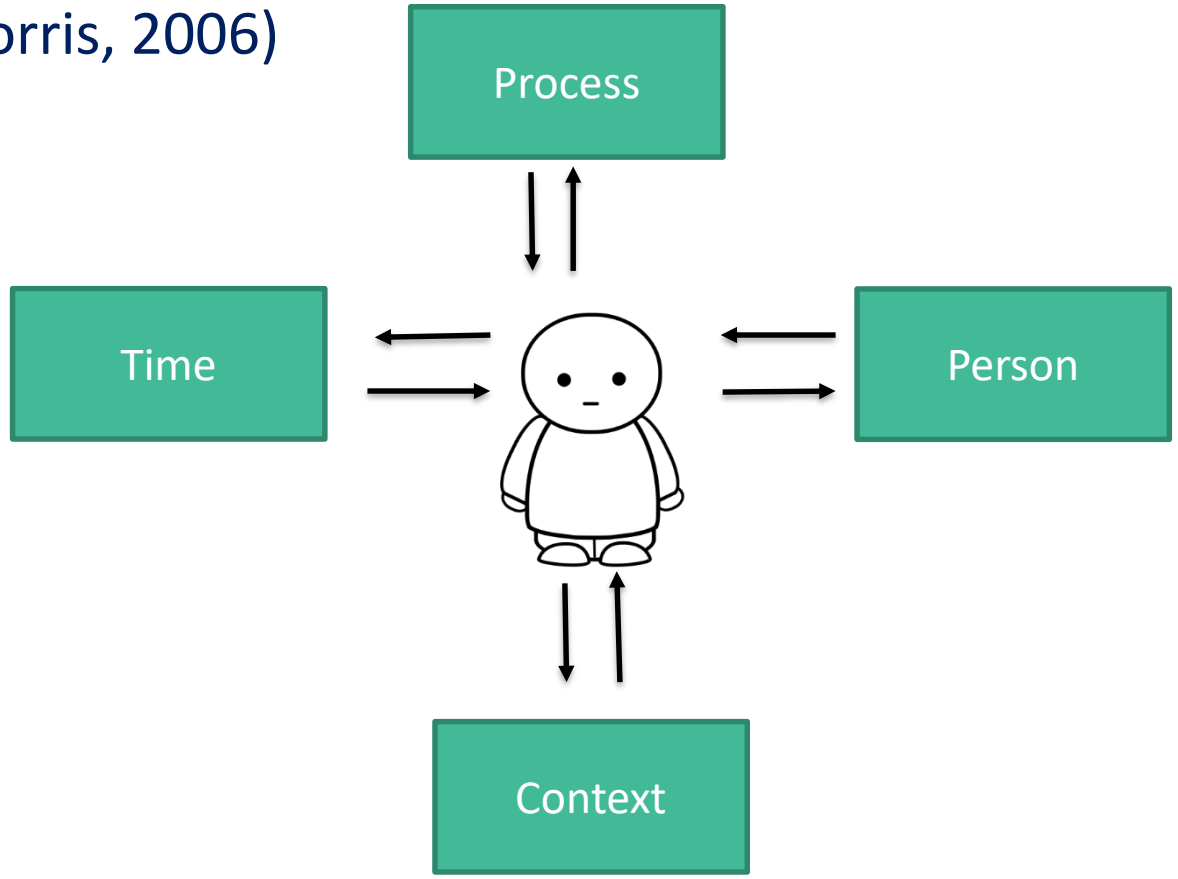
- Drumcondra Primary Mathematics Test (Revised)
- Piers Harris Self-Concept Scale
- Child questionnaire
- Primary caregiver questionnaire
- Teacher-on-self questionnaire
- Principal questionnaire

Framework

Bio-ecological Model of Human Development

(Bronfenbrenner and Morris, 2006)

Mathematics Attainment Age 9

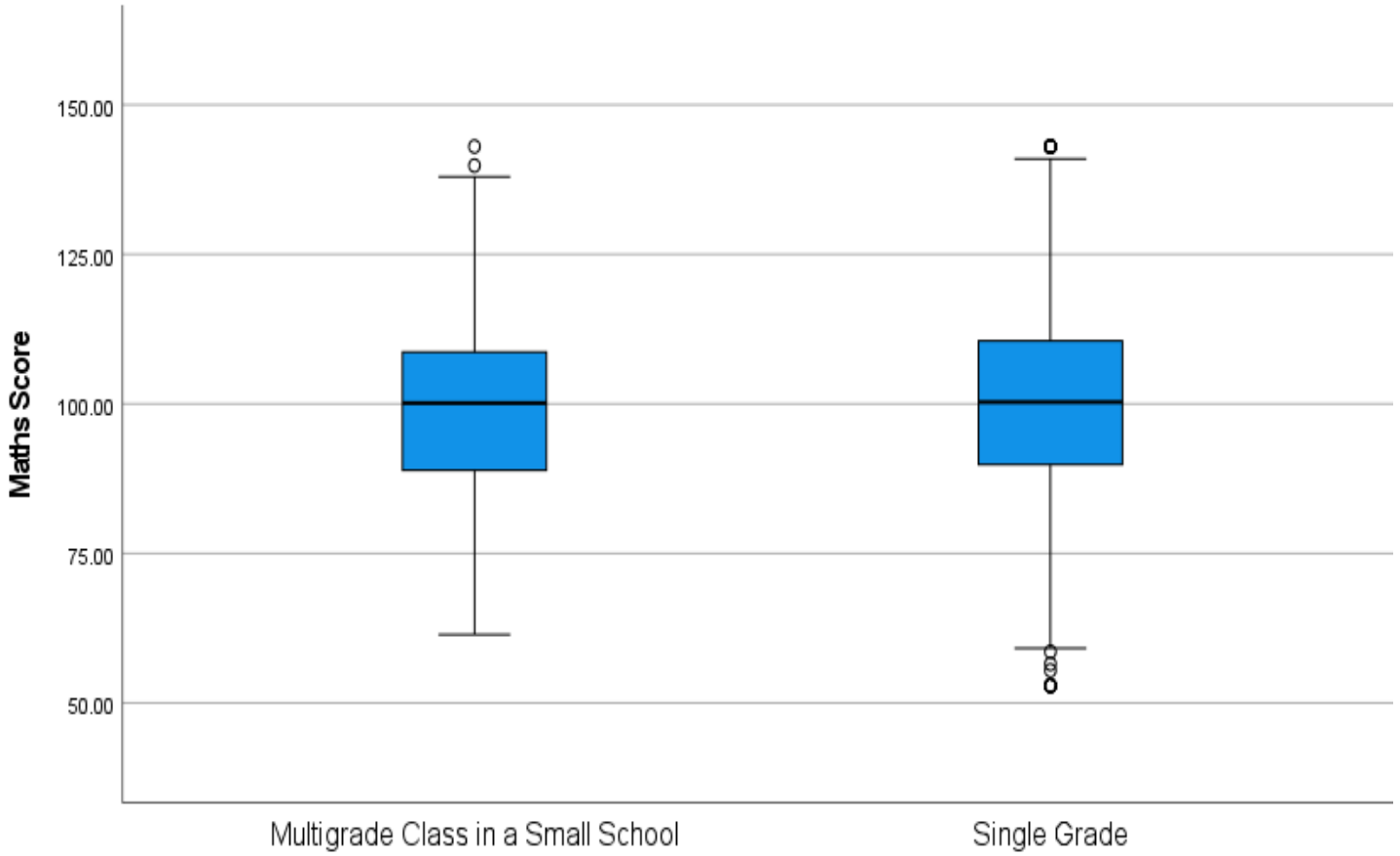


Outcome variable

- Drumcondra Maths Logit Score

- Rescaled prior to model building to have a mean of 100 and a standard deviation of 15
- Analysis of the distribution using descriptive statistics
- Comparison of the mean scores and examination of the distribution

Comparison of mathematics scores



Person characteristics

	63.176
Female	-2.903 **
Learning difficulty	-2.041
Born outside Ireland	-.381
Reading score	.342 **
Attitude to maths-Always liking maths Never liking maths	3.385 ** .856
School based self-concept Getting on well Getting on poorly	 1.431* .196
Self concept (overall)	.272 **

Individual characteristics explain 31.2% of variance in children's mathematics attainment.

Home context

	86.771		
Equivalised Household Income		Highest level of education of primary caregiver	
Quintile 2	1.560	Lower Secondary	2.717*
Quintile 3	2.314	Higher Secondary	1.390**
Quintile 4	2.569*	Non-degree	-.197
Quintile 5	1.116	Degree	-.182
		Postgraduate	1.266
Social Class		Urban Region	1.053
Unskilled/semi-skilled	-.086		
Other non-manual/skilled	2.514		
Professional/Managerial	2.958		
Lone Parent	-1.772	Parents Expectations	
		Leaving Cert	-3.092
		Trade	-.372
		Diploma/Certificate	-.148
		Degree	2.799
		Postgraduate	5.966

Variables relating to the home context explain 13% of variance in children's mathematics attainment.

School Context

	87.844		
Teacher Experience		Adequacy of books and worksheets	
3-5 years	-.452	Good	1.405
6-10 years	.574	Excellent	2.236
11-15 years	-1.764		
16-20 years	-2.302		
21-25 years	-2.678		
26-30 years	1.271		
30 or more years	-1.523		
Class Size		Learning Support Provision	
20-24	-1.745	Fair	5.898 **
25-29	1.602	Good	1.828
30 or more	.745	Excellent	.561
Adequacy of maths facilities		CPD	10.803**
Fair	-2.787		
Good	-2.180		
Excellent	1.378		

School context explain 3.3% of variance in children's mathematics attainment.

Process variables

	110.814		
Attendance		Pair work	
Absent 1-3 days	-4.287*	Some days	-5.194
Absent 4-6 days	-3.586*	Most days	-2.807
Absent 7-10 days	-4.058*	Every day	-10.331 *
Absent 11-20 days	-7.368**		
Absent more than 20 days	-8.195*		
Being bullied	-.062	Groupwork	
		Some days	-.941
		Most days	.906
		Every day	3.157
Maths time	.397	Whole class teaching	
		Some days	1.861
		Most days	3.828
		Every day	4.596
Individual work			
Some days	-13.233*		
Most days	-10.430		
Every day	-6.634		

4.7% of the variance in mathematics attainment is explained by process variables

Combined person, context, process model

Person	Home context	School context	Process
Gender	Primary Caregiver Education	Class size	Time spent teaching maths
Always liking maths		Maths facilities	Attendance
Reading score		Learning support provision	Frequency of individual work
Self-concept (overall)		CPD	

Combined model explains 38.4% of variance in the mathematics attainment of children in small schools.

Limitations

- Several relevant school context variables are not available in the AMF dataset
- Some of the variables used in the school context model may not be maths specific
- Drumcondra assessment measured attainment in a portion mathematical concepts addressed in the Primary Mathematics Curriculum at age 9

Conclusion

- The analysis does not detect any significant differences between the mean mathematics scores of children in multigrade classes in small schools and children in single grade classes.
- The GUI dataset facilitates an exploration of factors influencing mathematics outcomes among children in multigrade classes in small schools using the process, person, context, time framework.
- At this stage of the analysis, individual characteristics explain a greater portion of the variation in mathematics scores than contextual or process models.
- Many of the variables which are statistically significant in the models are not fixed characteristics.
- Further work is required to incorporate other important variables into the models.

Thank you

Thank you for listening.

All questions, comments and suggestions welcome.

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