

How Educational Effectiveness and School Improvement Research Can Promote Better Outcomes for Disadvantaged Groups

Keynote presentation for the ‘Promoting Quality and Equity: A Dynamic approach to School Improvement ‘ Conference

University of Cyprus 19 May 2017

Pamela Sammons

Department of Education University of Oxford



Content of Presentation

- **Defining ‘Equity’ in Educational Effectiveness Research**
- **Effectiveness not a simple concept: Issues - consistency, stability & differential effectiveness - Within School Variation**
- **Compositional effects (neighbourhood & school)**
 - The BFLP theory
- **Theoretical Models - The Dynamic Model (DASI)**
- **Potential of Educational Influences to Ameliorate Disadvantage – examples from the Effective Pre-school Primary and Secondary Education (EPPSE 3-16+) study**
 - Risk & Resilience
 - Role of the Home Learning Environment
 - Pre-school experiences
 - Primary school academic effectiveness
- **‘Inspire Maths’ Evaluation**
 - Findings from a mastery maths intervention in Year 1 primary classes in England

Equity Challenges for Educators

Students from disadvantaged backgrounds are more likely than others to experience educational failure

Reasons for addressing such failure

philosophical/ethical - to promote fairness improvement in quality of life and opportunities for all groups, to encourage positive attitudes to future learning and self-esteem

political - to promote social cohesion and inclusion and empower young people as citizens to participate in a successful democracy

economic - to promote future prosperity & prevent waste of talent & avoid social/economic burden on public purse

Defining Equity and Equality in Education

- ▶ **Formal equality of access/provision**
- ▶ **Equality of participation (treatment)**
- ▶ **Equality of outcome**

Charalambos, Kyriakides & Creemers (2016) argue that societies increasingly seek to raise quality (outcomes) standards and promote equity (reduce differences in outcomes for disadvantaged groups).

They distinguish 'meritocratic' and 'egalitarian' views on the role of schools in reducing differences in learning outcomes

- **Although schools are important in the development of social inclusion wider social and economic policies are also highly relevant**
- **EER & SI research seeks to study and work with practitioners to enhance understanding about the processes of effective and improving schools in different contexts and equity considerations remain a key focus e.g. The Dynamic Approaches to School Improvement Model (DASI)**

Focus of Educational Effectiveness Research (EER)

The central focus - a belief in the potency of social institutions

‘the idea that schools matter, that schools do have major effects upon children’s development and that, to put it simply, schools do make a difference’ (Reynolds & Creemers, 1990)

Foci of EER studies include identifying the:

- ▶ **Size and extent of school and teacher effects**
- ▶ **Characteristics that promote better student outcomes, especially for disadvantaged groups**
- ▶ **Influences of context on outcomes and processes**
- ▶ **Processes of institutional change – including theories of change**
- ▶ **Long term impact of schools & schooling on life chances**

'Risk Factors' in Education

Cox (2000) argues that it is the '*multiplicative and interactive*' nature of risk factors that gives the concept of educational disadvantage its complexity

Individual factors e.g. Low birthweight, 'young for year', gender, physical attractiveness etc

Family factors e.g. Family structure (1 or 2 parents), family size, parents' education level, parents income level, parents' employment status, family SES, ethnic group, language background etc

Contextual factors e.g. Rural/urban location, advantage/disadvantage level of neighbourhood,

School composition e.g selection/tracking, average prior attainment level of student intake, % disadvantaged students etc

The Impact of Intake

‘Natural justice demands that schools are held accountable only for those things they can influence (for good or ill) and not for all the existing differences between their intakes’

(Nuttall 1990)

EER seeks to disentangle the impact of prior attainment and background characteristics from the impact of school and classes/teachers on students’ progress/social or affective outcomes.

‘Schools matter most for underprivileged and/or initially low achieving students. Effective or ineffective schools are especially effective or ineffective for these students’

(Scheerens & Bosker 1997)

Compositional Effects

EER studies often show negative associations between level of disadvantage of student intake and both individual student and school performance, and positive effects for average prior attainment level of student intake

How should such apparent ‘compositional’ contextual effects be interpreted?

Recent studies suggest they may operate through influences on school and classroom **processes** (see Dumay & Dupriez, 2008; Danhier & Martin, 2014)

Televantou et al. (2015) draws attention to ‘phantom effects’. Controlling for measurement error altered apparent positive effects of school average prior attainment on student progress.

Marsh and colleagues have conducted many studies of the ‘Big Fish Little Pond Effect’ (BFLPE). These show that being taught in academically selective schools leads to negative effects on both students’ academic self concept and attainment. This adds to the evidence base about selective schooling and has implications for policies to enhance equity and promote SI

Such findings also point to the need for appropriate statistical models and methodological advancement in understanding of school effects and the links between context and processes that are relevant to SI (Creemers, Kyriakides & Sammons, 2010)

Complexity in Judging Performance

Definitions of effectiveness are dependent on:

- *choice of outcome measures* (focus on basic skills/exams gives only a partial picture of effectiveness) need social & affective as well as cognitive
- *methodology* and adequacy of intake controls – prior attainment, contextualised ‘value added’, compositional effects etc
- *timescale* – 3 years is minimum for a trend and to study improvement

‘Effectiveness is not a neutral term. Defining the effectiveness of a particular school always requires choices among competing values ... the criteria of effectiveness will be the subject of political debate’
(Firestone, 1990)

Effectiveness a *retrospective, relative concept* that is time and outcome specific

- Effective in promoting which outcomes?
the *what* of effectiveness - **Consistency**
- Effective for which student groups?
the *who* of effectiveness - **Differential effectiveness**
- Effective over what time period?
the *when* of effectiveness - **Stability/Improvement/Decline**
- **Trends over Time**

These questions provide a focus for school self evaluation & review linked to exploring '**Within School Variation**' (WSV) and the development of improvement initiatives - they have important implications for the promotion of equity

Student Self-report Measures & WSV

Broader Outcomes

- Questionnaires can provide additional measures of important social behavioural and affective outcomes e.g. academic self concept, attitudes, enjoyment of school, mental health, motivation & social behaviour, including bullying

- *School & Classroom processes*

They can also be used to develop measures of students' school experiences including:

- school climate and organization,
- teaching quality and classroom practice

These can complement evidence from classroom observations and shed light on WSV and Equity in terms of the quality of experiences for different student groups

Use of Student Surveys: Theoretical & practical advantages

Students are taught by a variety of teachers in different subjects over their school careers, and so can be viewed as '*experts*' in terms of their experiences of different teachers and their practices

Survey data can be analysed by multilevel models (school/class/individual levels) to distinguish both shared and unique variance in students' perceptions

Responses can be compared for different student groups

Surveys are relatively easy and cost effective to administer and provide opportunities for students to give feedback on their experiences

Indices for Measuring Equity in EER (1)

Kelly (2015) provides a detailed review of the properties of different quantitative measures of equity to analyse variations in school performance using worked examples from the English NPD. He cites an EU definition:

‘Equity is the extent to which individuals can take advantage of education in terms of opportunities . . . and outcomes. Equitable systems ensure that the outcomes of education are independent of [all] factors that lead to educational disadvantage’(EU, 2006)

‘...any metric aimed at capturing equity and effectiveness will mask the finer detail of learning and schooling, but summative metrics nevertheless have their uses enabling comparisons to be made between and within schools over time’ (Kelly, 2015:116)

Indices for Measuring Equity in EER (2)

Kelley (2015) proposes the **Attainment Equity Index (the $\mathcal{A}E$ Index)** a Gini-based measure and shows how it can be combined with other measures of school performance including 'value added (VA) and contextual value added (CVA) residual measures often studied in EER .

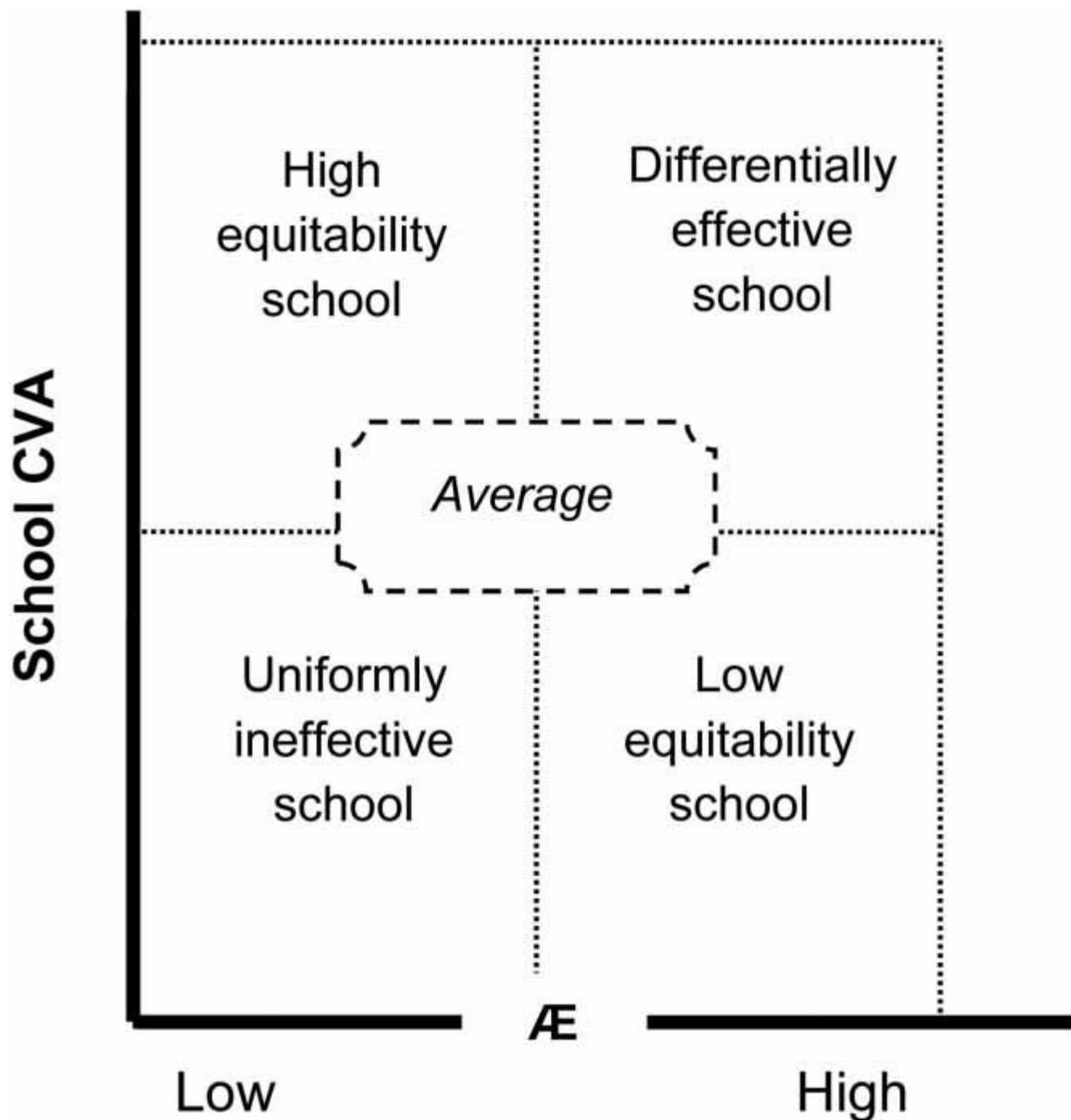
He argues that:

'The way the $\mathcal{A}E$ Index can be used in combination with measures like CVA is a strength, as is the fact that its ratio analysis allows suggestive (rather than definitive) comparisons to be made in line with other effectiveness measures'

'Whatever its cause, measuring inequity can help gauge the effectiveness of policies aimed at reducing it, and can generate the empirical data necessary to use equity as an explanatory variable in policy analysis, particularly in relation to the distribution of 'hard' outcomes like examination attainment.'

An Equity
Classification
System from
Kelly (2015:125)

Comparing
School CVA
Performance
With
Attainment Equity
Index



Theories of Effectiveness and Ineffectiveness and Implications for SI

Scheerens (2015) quotes the society for research on educational effectiveness arguing it should support the development of *explanatory and predictive theories of educational processes and mechanisms*.

‘Education research must answer questions about why, how, under what circumstances, and for whom, education practices and policies affect individual outcomes.

Without an evidence-based theory of educational processes and mechanisms, pragmatic evidence of effectiveness may not be generalizable to new settings or different populations.’ <https://www.sree.org/conferences/2011/>

These points also link with the study of differential effectiveness and WSV

Scheerens posits that SI is best seen as the *implementation branch* of EER and so should address the practical basis for enhancing the quality of schooling, especially for disadvantaged students

Both effectiveness and equity can be seen as important facets of educational quality and foci for SI interventions.

Theories of Effectiveness and Ineffectiveness and Implications for SI

Scheerens (2015) quotes the society for research on educational effectiveness arguing it should support the development of *explanatory and predictive theories of educational processes and mechanisms*.

‘Education research must answer questions about why, how, under what circumstances, and for whom, education practices and policies affect individual outcomes.

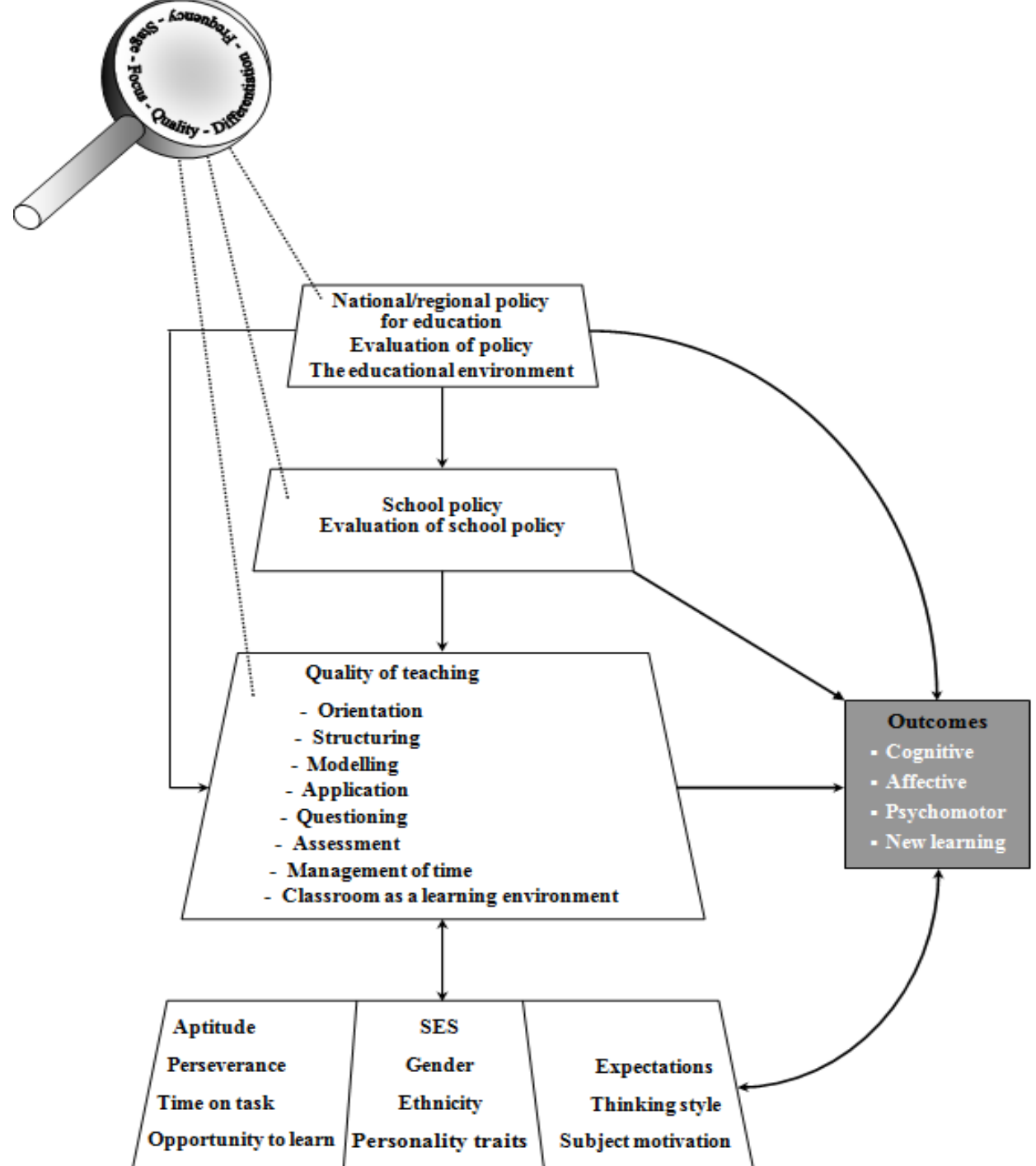
Without an evidence-based theory of educational processes and mechanisms, pragmatic evidence of effectiveness may not be generalizable to new settings or different populations.’ <https://www.sree.org/conferences/2011/>

These points also link with the study of differential effectiveness and WSV

Scheerens posits that SI is best seen as the *implementation branch* of EER and so should address the practical basis for enhancing the quality of schooling, especially for disadvantaged students

Both effectiveness and equity can be seen as important facets of educational quality and foci for SI interventions.

After Creemers
& Kyriakides
(2008)
The Dynamic
Model of
Educational
Effectiveness



Factors Linked to Quality of Teaching in the Dynamic Model

From Kyriakides (2015) Improving Teaching Quality: A Dynamic Approach to Teacher Professional Development, Keynote Presentation at the 16th Biennial Conference EARLI 2015

- 1) Orientation
 - 2) Structuring
 - 3) Questioning
 - 4) Teaching modelling
 - 5) Application
 - 6) The classroom as a learning environment
 - 7) Management of time
 - 8) Assessment
- Each factor is defined and measured using five dimensions: *frequency, focus, stage, quality, and differentiation.*
 - The five dimensions are not only important for a measurement perspective but also and even more for a **theoretical point of view**

Main Features of DASI

After Kyriakides et al (2014)

- ❖ DASI emphasizes the role of **guided and research informed** school evaluation in improving the effectiveness status of the school.
- ❖ An **Advisory and Research Team** shares its expertise and knowledge with practitioners and helps them identify improvement areas and develop strategies and action plans that are in line with the knowledge-base of EER.
- ❖ **School stakeholders** are those who take decisions on which improvement actions and tasks should be carried out.
- ❖ The role of **Formative evaluation** is stressed. **Data** of formative evaluation may help schools continuously adapt their action plans to the skills and needs of students, teachers, parents and other school stakeholders.

Equity and Effectiveness: Examples from the Effective Pre-school, Primary and Secondary Education (EPPSE 3-16) Research in England

EPPE/EPPSE adopted a mixed methods, longitudinal EER design. It followed children from the early years across different phases of education.

Children (2800) were recruited at age 3+ in 141 pre-schools in 6 regions. The sample was clustered at the pre-school level. An additional 'home' sample (300) that had no pre-school attendance was recruited at entry to primary school from reception classes attended by EPPSE children.

The study was funded by the DfE in England

EPPSE Sample : 6 Local Authorities, 141 pre-schools, 3,000 children

Pre-school
(3 – 5 yrs)



25 nursery classes
590 children

34 playgroups
610 children

31 private day nurseries
520 children

20 nursery schools
520 children

24 local authority day care nurseries
430 children

7 integrated centres
190 children

home
310 children

Age 5-7	Age 7-11	Age 11-14	Age 14-16
Key Stage 1	Key Stage 2	Key Stage 3	Key Stage 4
862 schools	1,128 schools	739 schools	737 schools
			22

- **Child assessment (social/behaviour & academic/cognitive) at 3, 4+, 6, 7, 10, 11, & 16 years**
- **Family background at 3, 6 and 11 & 14**
- **Interviews/questionnaires with staff**
- **‘Quality’ rating scales in pre-school**
- **Case studies of effective pre-school settings**
- **Measures of primary school academic effectiveness (contextual value added)**
- **Pedagogical observations in primary school**
- **Students’ views of school at age 7, 10, 14, 16**
- **Teachers’ views on school processes and practice in Yr 5 & Yr 9**
- **DfE CVA indicators of secondary school academic effectiveness**
- **Ofsted Inspection ratings of school quality**

Sources of data

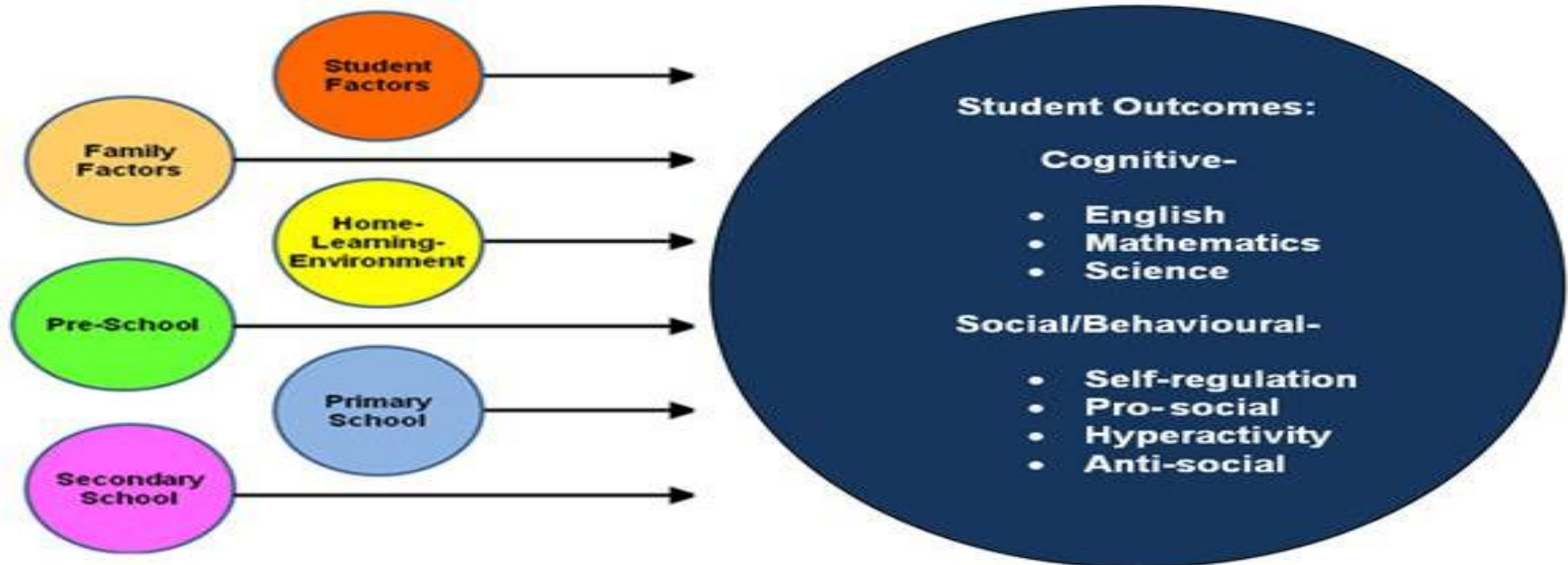


EPPSE explored how individual, family and home characteristics relate to children’s cognitive and social-behavioural development

It also focused on the continuing impact of pre-school as well as the importance of primary and secondary school experiences

EPPSE investigated both ‘in school’ and ‘out of school’ learning opportunities.

Influences on student outcomes in primary school



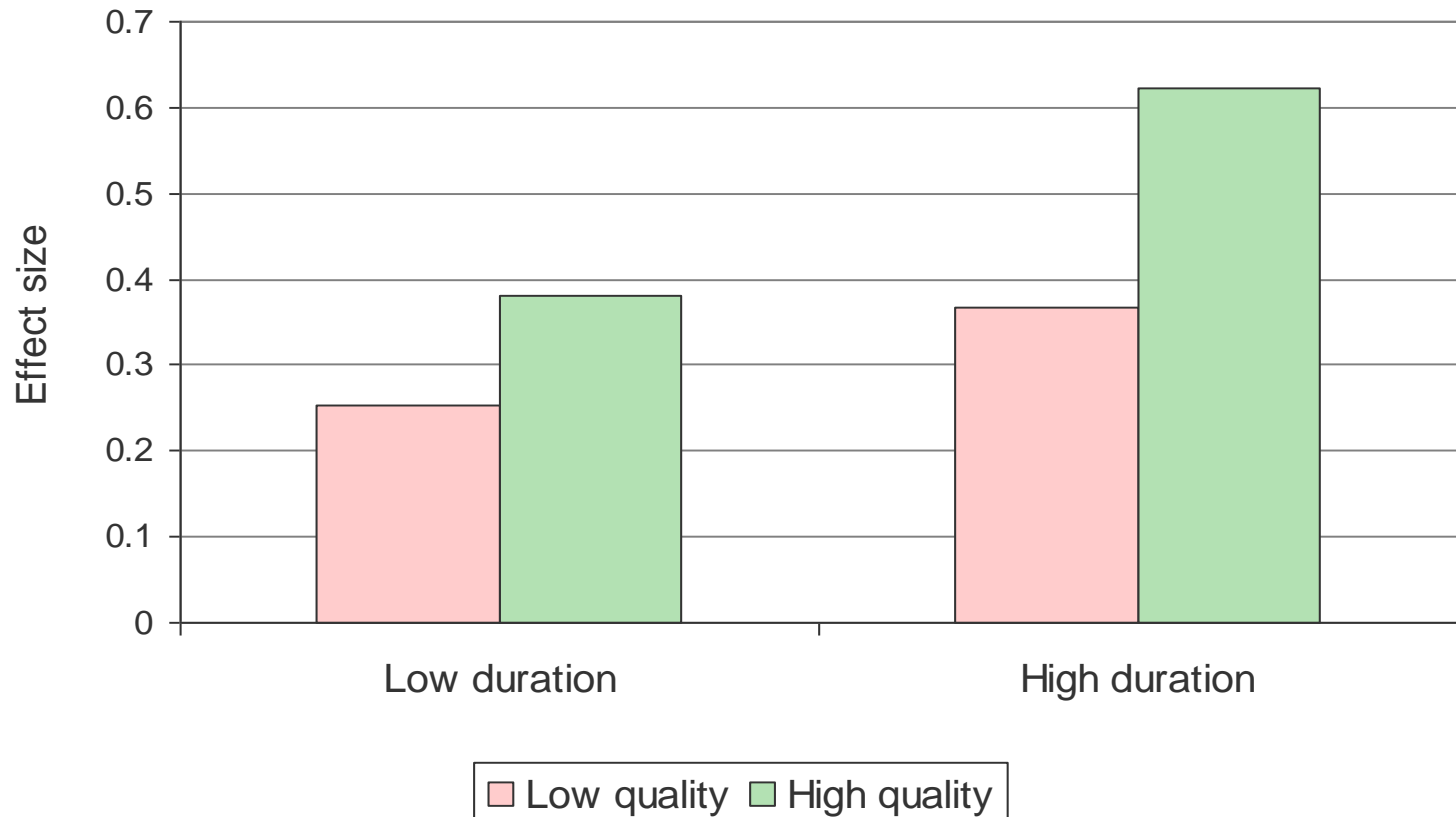
Analyses include:

- ❖ Descriptive statistics
- ❖ Multivariate analyses
- ❖ Exploratory & confirmatory factor analyses
- ❖ Multilevel (value added) analyses of progress
- ❖ Growth curve modelling
- ❖ Structural equation modelling
- ❖ Trajectory analyses (PROC TRAJ)
- ❖ Multiple imputation (ICE & Amelia)
- ❖ N-vivo analyses of observations & Qualitative data reduction techniques

Pre School Matters

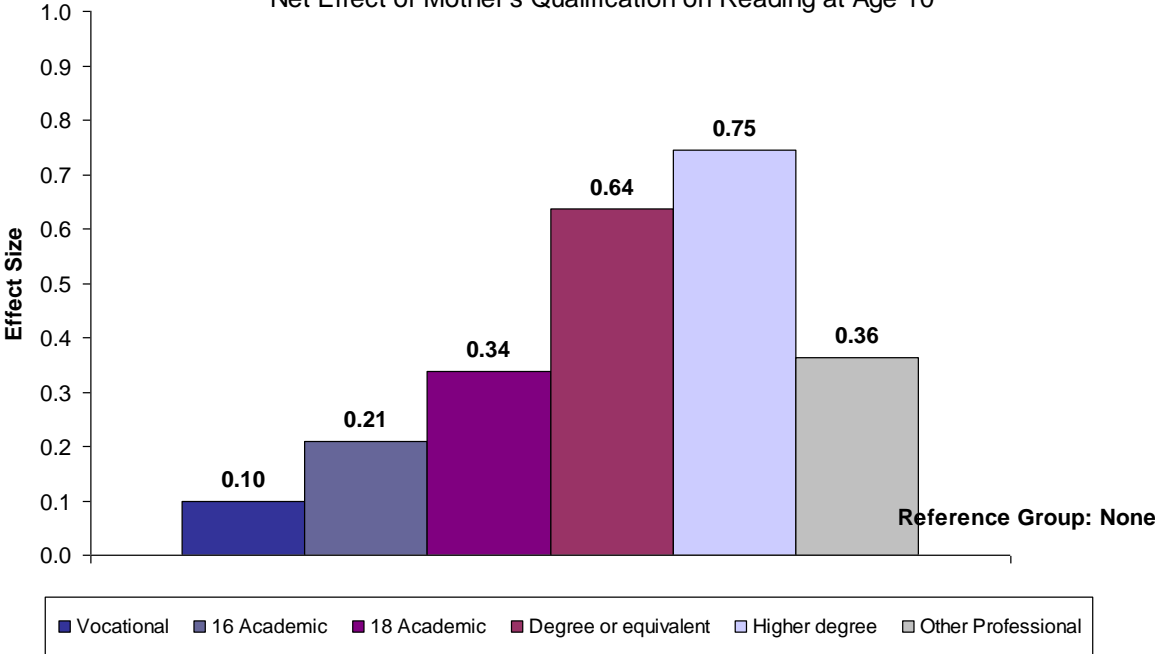
Effect of quality and duration of pre-school (v none) on pre-reading at school entry EPPE research (Sylva et al 2004)

Pre-reading at school entry



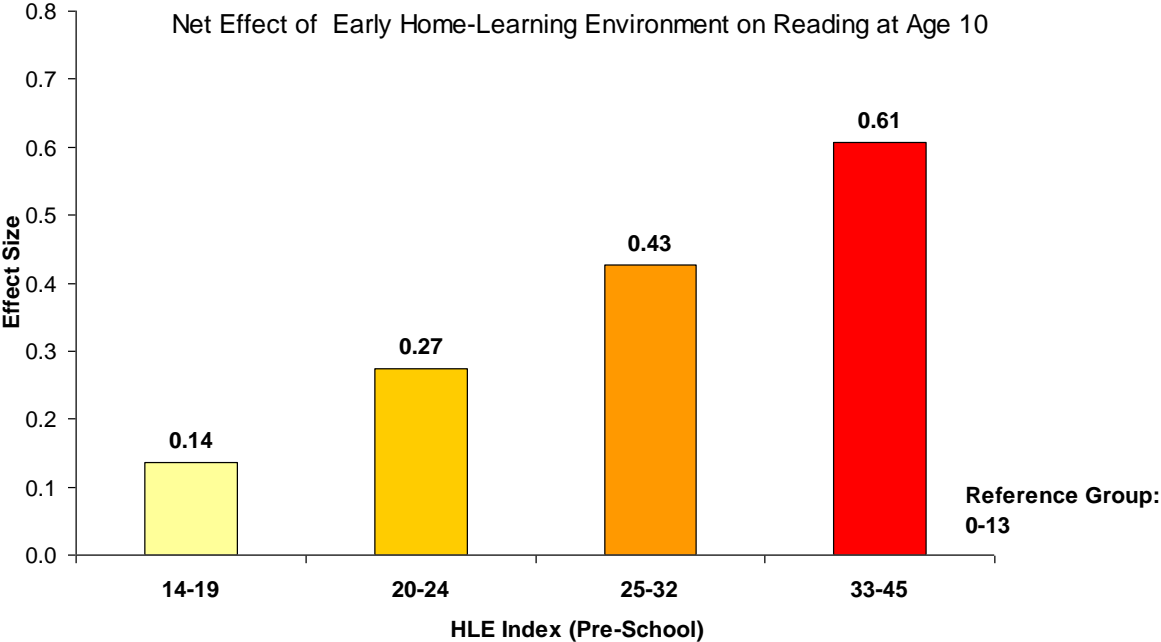
Mother's Qualification

Net Effect of Mother's Qualification on Reading at Age 10

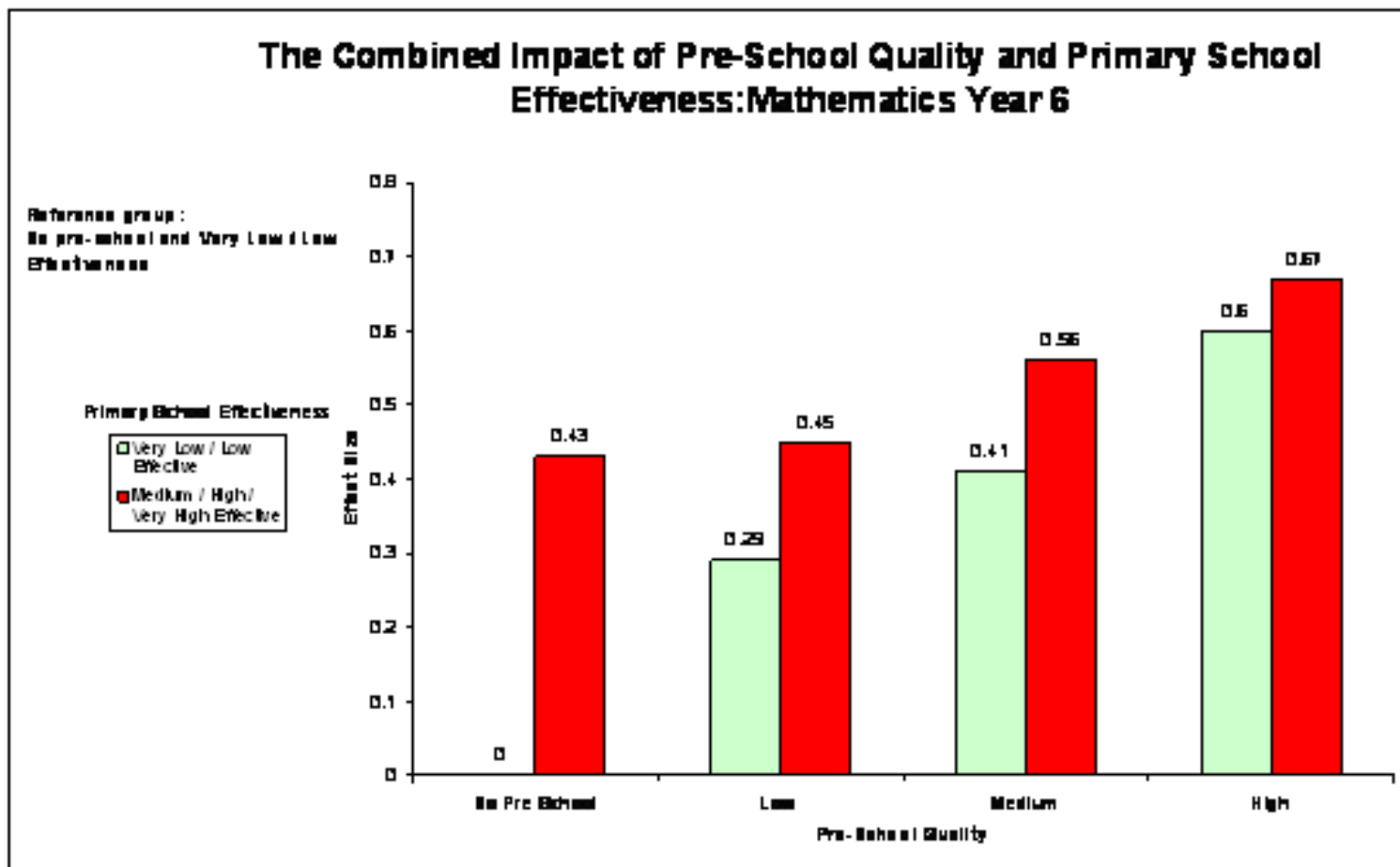


HLE (Early Years)

Net Effect of Early Home-Learning Environment on Reading at Age 10



The Combined Impact of *Pre-school Quality* & Primary School Academic Effectiveness on Maths Attainment at age 11



The better the quality of pre-school the higher the attainment, and the more academically effective the primary school the higher the attainment.

Children who did not attend pre-school gain a particularly strong benefit from attending a more academically effective primary school.

Overview of EPPE findings up to age 11 years

- **Quality and effectiveness of pre-school remain predictors of attainment throughout primary school up to age 11 and for progress from age 7 to 11 (e.g. for Quality of pre-school ES 0.23 English, ES 0.20 maths).**
- **The academic effectiveness of the primary school attended also predicts pupils' academic attainment and progress from age 7 to 11 (e.g ES 0.37 English; ES 0.52 for mathematics for progress)**
- **Child's background characteristics remain strong predictors of outcomes, particularly the early HLE and parental qualifications**
- **The combination of educational experiences is important (i.e., joint effects of pre-school quality and primary school academic effectiveness)**
- **Protective effects of pre-school quality and of primary school academic effectiveness that ameliorate the impact of disadvantage were identified by Hall et al, 2013 and Sammons et al 2013**

Risk & Resilience: Pre-school as a Protective Factor that Ameliorates the Effects of Disadvantage & Risk of Special Educational Needs (SEN)

Anders, Y., Sammons, P., Taggart, B., Sylva, K., Melhuish, E., Siraj-Blatchford, I. (2011) The influence of child, family, home factors and pre-school education on the identification of special educational needs at age 10, *British Educational Research Journal*, 37(3), 421-441.

Hall, J., Sylva, K., Melhuish, E., Sammons, P., Siraj-Blatchford, I., & Taggart, B. (2009). The role of pre-school quality in promoting resilience in the cognitive development of young children. *Oxford Review of Education*, 35, 331-352.

Hall, J., Sammons, P., Sylva, K., Melhuish, E., Taggart, B., Siraj-Blatchford, I., & Smees, R. (2010) Measuring the cumulative risk to children's cognitive development: Confirmatory factor analysis using formative measurement. *British Journal of Developmental Psychology* 28, 219-238.

Hall, J., Sylva, K., Sammons, P., Melhuish, E., Siraj-Blatchford, I., Taggart, B. (2013). Can pre-school protect young children's cognitive and social development? Variation by center quality and duration of attendance. *School Effectiveness and School Improvement: An International Journal of Research, Policy and Practice*, 24(2), 155-176.

Taggart, B., Sammons, P., Smees, R., Sylva, K., Melhuish, E., Siraj-Blatchford, I., Elliot, K., Lunt, I. (2006). Early identification of special needs and the definition of 'at risk': the Early Years Transition and Special Education Needs (EYTSEN) Project. *British Journal of Special Education*, 33, 40-45

Child, Family, HLE, Pre- and Primary school Influences on Maths at age 11

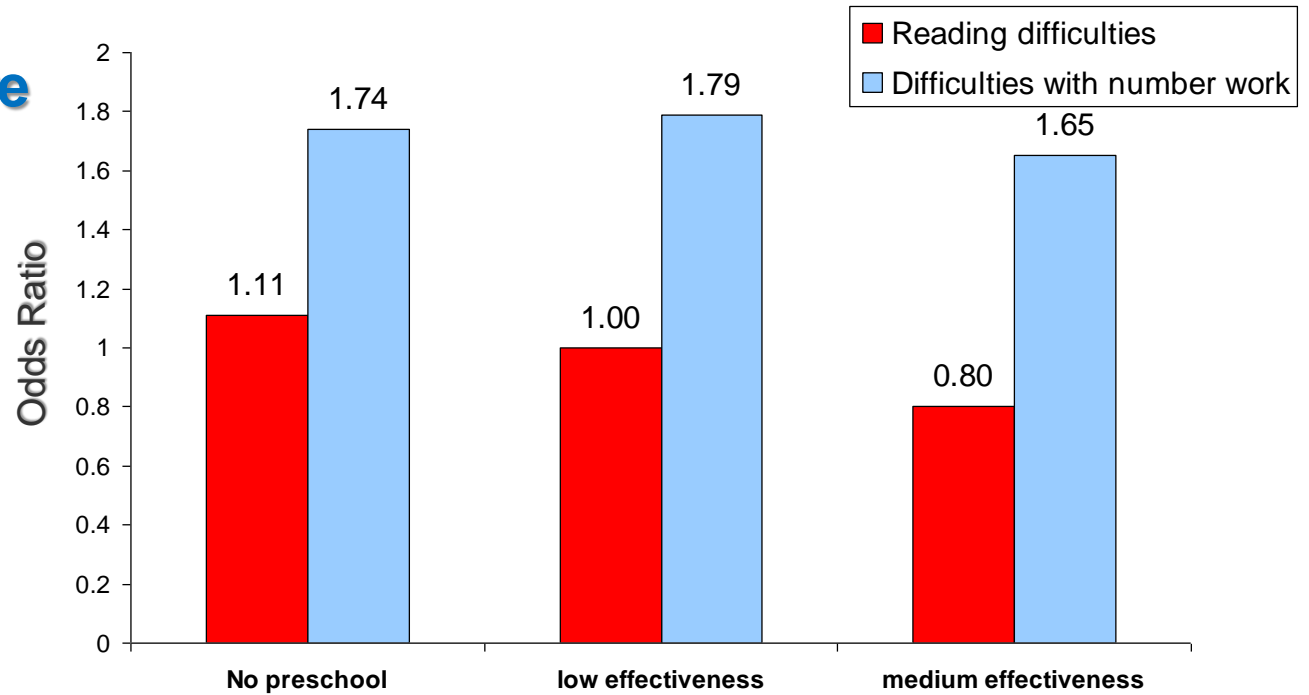
Factors	Effect Size	Description
Gender	0.19	Boys show higher attainment than girls.
Birth weight	0.48	Normal birth weight higher than very low.
Ethnic groups	0.45	Indian heritage higher than children of White UK heritage.
Need for EAL support	0.64	Need of EAL support = predictor of low attainment.
Developmental problems	0.15	Early developmental problems = predictor of low attainment.
Parents' qualification	0.71	Higher qualified parent = higher attainment.
Socio-Economic Status	0.36	Higher SES = higher attainment.
Free School Meals	0.15	Eligible for FSM = lower attainment.
Early years HLE	0.42	Higher Early years HLE = higher attainment.
Three Pre-school Measures Tested Separately		
Pre-school	0.26	Attended vs. not attended
Pre-school quality (ECERS-E)	0.34	High quality pre-school = higher attainment
Pre-school effectiveness	0.40	Highly effective pre-school = higher attainment
Primary school academic effectiveness	0.38	Highly effective primary school = higher attainment

Comparing the models for attainment and SEN

Factor	Reading		Mathematics / Number work	
	Attainment	SEN	Attainment	SEN
Gender	●	●		
Birth weight	●	●	●	●
EAL	●		●	
Ethnic group	●		●	
No. of siblings	●			
Developmental problems	●	●		●
Early health problems			●	●
FSM eligibility	●	●	●	●
Family SES	●	●	●	
Mother's highest level of qualification	●	●	●	●
Father's highest level of qualification	●		●	
Family salary	●		●	●
Early years HLE	●	●	●	●
Pre-school quality	●	●	●	●
Pre-school effectiveness	●		●	●

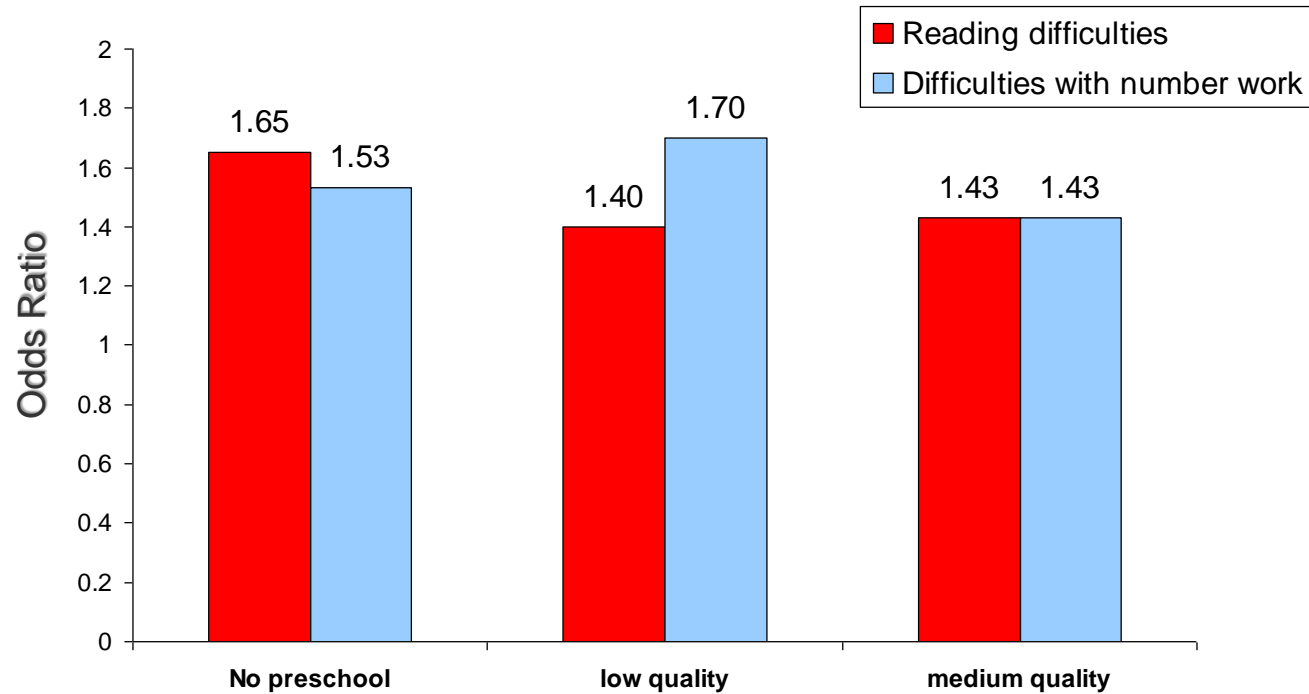
Preschool centre effectiveness

Reference group:
high effectiveness



Preschool quality

Reference group:
high quality



Summary of EPPE Findings on Risk & Resilience for SEN

- Evidence on child, home and family 'risk' factors that predict SEN at age 10
- Protective factors include a good early years HLE
- Risk factors include being young for year (summer born) even when control for age standardised attainment
 - Suggests teachers may be using class average as a reference point ?
- High quality preschool can be interpreted as a form of protective intervention that helps improve later attainment and reduce the chances of SEN identification at age 10
- Rather than relying solely on strategies to support SEN in primary school, it is important to promote children's development at an earlier age through high quality preschool education to reduce the risk of SEN
- The importance of the early years HLE points to the potential of early years parent interventions to help parents better support their children's development.

Studying Quality of Teaching in Primary Maths : A Recent Example informed by TER

Evaluation of a Singapore-based maths textbook and teaching approach in Year 1 classrooms in England

Findings from a Mixed-Method Randomised Controlled Trial

James Hall, Ariel Lindorff, Pam Sammons (2016)
Department of Education, University of Oxford



Full report: <https://global.oup.com/education/mastery/impact-report?region=uk>

What is Inspire Maths?

- **A mastery-based textbook series and pedagogical approach marketed by Oxford University Press (OUP)**
 - **Based on the textbooks and pedagogical approaches used in Singapore, but adapted for use in England**
 - <https://global.oup.com/education/content/primary/series/inspire-maths>
- **The main features of Inspire Maths include:**
 - **Professional development for teachers to support the use of the programme from OUP**
 - **The use of particular approaches and materials (including textbooks, workbooks, assessment books)**
 - **An emphasis on multiple representations of mathematical concepts, specifically the Concrete-Pictorial-Abstract (CPA) approach (Ministry of Education, 2012)**
 - **Frequent and varied use of manipulatives**
 - **Mixed ability grouping**
 - **A variety of questioning techniques, including higher-order questions**

Background/Context

- East Asian mastery approaches to teaching mathematics have gained international prominence especially the approach and texts used in Singapore, they are claimed to enhance equity
- Recent educational policy shifts in the UK, including the rollout of a new National Curriculum, have emphasised mastery approaches to teaching and learning
- However, little UK evidence of the effectiveness of a mastery approach for teaching maths or on implementation processes or teachers' perspectives
 - Previous research includes another RCT (Jerrim & Vignoles, 2016; Vignoles, Jerrim & Cowan, 2015), focusing only on pupil achievement outcomes
- This RCT evaluation aimed to address this evidence gap (and is the first evaluation of Inspire Maths in particular)

Research Questions

Concerning Year 1 Pupils:

- What impact does Inspire Maths have on pupils' attainment and progress in mathematics?
- What impact does Inspire Maths have on pupils' attitudes towards mathematics?

Concerning the Implementation of Inspire Maths:

- To what extent and in what ways do schools and teachers differ in their implementation of Inspire Maths?
- What are teachers' views on, and experiences of, implementing Inspire Maths?
- What benefits or challenges (for teachers, pupils & schools) are associated with using Inspire Maths?

Concerning OUP support and services:

- What are teachers' views on and experiences of OUP support and services for Inspire Maths? (professional development and online resources)

Evaluation Design & Methods

➤ Methodology:

- A Randomised Controlled Trial (RCT) for children in Year 1, with schools randomly allocated to:
 - An “experimental group” of schools that used Inspire Maths from September 2015
 - A “delayed treatment group” of schools that used Inspire Maths from January 2016

➤ Data collection:

- Mixed methods - Both quantitative and qualitative data sources
- Data were gathered three times during the school year – once per term, 1-day visit to each participating classroom

Sources of evidence and sampling

➤ Data sources:

- Pupil assessments
- Pupil questionnaires
- Semi-structured teacher interviews
- Systematic and qualitative classroom lesson observations
- Observations of professional development sessions run by OUP staff (qualitative field notes)

➤ Sample:

- 12 schools
- 20 Year 1 teachers
- 576 Year 1 pupils

Quantitative Measures

- Pupil Attainment and Progress in Mathematics:
 - ❖ “Progress Tests In Maths” (GL Assessment, 2015)
 - An age-standardised measure of pupil attainment relevant to the 2015 National Curriculum
 - Level 5 used at the first two time points, Level 6 at the third time point (different levels are vertically equated)

- Pupil Attitudes towards Mathematics:
 - | A 4-item questionnaire adapted from Barber and Houssart (2011):
 - Pupils’ attitudes towards *‘Doing numbers and sums (or number sentences)’*
 - Pupils’ attitudes towards *‘Counting things’*
 - Pupils’ attitudes towards *‘Using [manipulatives] in lessons’*
 - Pupils’ attitudes towards *‘Learning about shapes and patterns’*

- Classroom Practice:
 - ❖ Three observation schedules:
 - International System of Teacher Observation and Feedback (ISTOF; Teddlie et al., 2006)
 - Lesson Observation Form for Evaluating the Quality of Teaching (QoT; van de Grift et al., 2007)
 - Mathematics Enhancing Classroom Observation Recording System (MECORS; Schaffer, Muijs, Reynolds, & Kitson, 1998)

Qualitative evidence

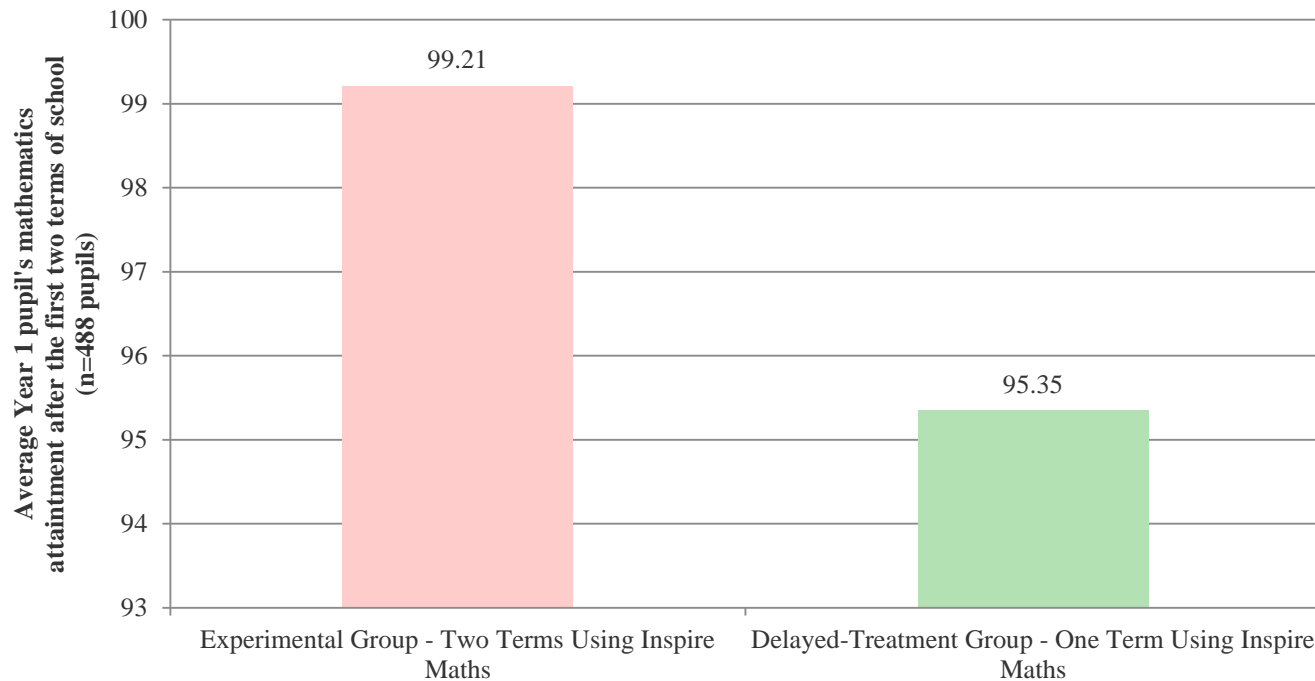
- **Semi-structured interviews with participating teachers**
 - Conducted during each of the termly school visits, following classroom observations
 - Questions focused on
 - Accounts of teachers' own practice and changes to practice,
 - Accounts of the needs and dynamics of each Year 1 class group
 - Experiences using the Inspire Maths materials and approach
 - Experiences and opinions of OUP support (professional development and online services)
 - Perceived benefits and challenges
- **Classroom observation field notes**
 - Detailed descriptive and narrative accounts to supplement structured observation ratings

Quantitative Models

- Multilevel regression models for measures of attainment and progress in maths, plus changing attitudes towards maths
- Multilevel effect sizes to compare intervention versus control group (using formulas from Elliot & Sammons, 2004)
- General linear models for comparing teachers and classrooms on systematic observation measures of classroom practice
- Effect sizes were again calculated. Partial eta squared values (η_p^2) were used to compare the magnitudes of effects (proportion of teachers' classroom practice attributable to differences between the experimental and delayed treatment groups)
- Additional predictors in analyses of outcomes: score at previous testing point or baseline, pupil age, pupil gender, teacher experience (total years teaching), teacher experience teaching Year 1 (proportion of years teaching), days since first test at testing point, days since first test at previous testing point

Intervention Effects on Year 1 Pupils' Attainment in Mathematics

- ▶ Although all children progressed in mathematics throughout Year 1, the experimental group showed significantly higher attainment on average after two terms' use of Inspire Maths (as compared to one terms' use in the delayed treatment group)



- ▶ **Multilevel Effect Size = 0.42 (SE=1.80, p=0.046)** standard deviation for the effect of being in the intervention group versus control group after controlling for attainment at the start of the second term and differences linked to: term test dates, pupil gender differences, teachers' experience (years teaching), teachers' experience spent teaching Year 1 (proportion of years).

Statistical Evidence of Impact upon Year 1 Classroom Practice

- **Use of Inspire Maths was strongly associated with teaching practices considered effective based on previous TER**
- **Significant differences in observed measures of teachers' classroom practice found between groups at the beginning of the year (September)**
 - **Teachers in the September-start group had already completed 2 days of professional development before the start of the year, and were using the resources**
- **After one term, the teachers in the intervention group showed further increases in observed measures of effective classroom practice**
 - **The delayed treatment group that began using Inspire Maths after one term also showed improvements in effective classroom practice following OUP professional development**
- **After two terms, teachers in the intervention group using Inspire Maths since September showed further increases on observed measures for differentiation and inclusion**
 - **In addition, teachers that started using Inspire Maths in January were 'catching up' in their use of effective classroom practices/behaviours, i.e. Differences between groups were smaller at the end of the evaluation**

Observation Results for Year 1 Classroom Practice (2)

The 17 areas of observed teacher behaviour and practice where large differences were observed between the intervention and delayed treatment groups at the start of the 2015/16 academic year(September)

Structured Observation	Teacher behaviour or teaching practice	Evidence concerning how the implementation of Inspire Maths was related to altered teaching practice at the start of the 2015/16 academic year
The Lesson Observation Form for Evaluating the Quality of Teaching (QoT)	Stimulating Learning Climate	These teaching behaviours and teaching practices were <i>more strongly evident</i> in classrooms that were led by teachers who had starting using Inspire Maths ...By contrast, this teaching practice was <i>much less evidenced</i> by those teachers who had started using Inspire Maths
	Clear Instruction	
	Activating Pupils	
	Effective Classroom Organisation	
	Effective Classroom Layout	
	Adaptation of Teaching	
International System of Teacher Observation and Feedback (ISTOF)	Assessment and Evaluation	These teaching behaviours and teaching practices were <i>much more readily apparent</i> in classrooms that were led by those teachers who had started using Inspire Maths
	Clarity of Instruction	
	Instructional Skills	
	Promoting Active Learning and Developing Metacognitive Skills	
	Classroom Climate	
	Classroom Management	
Mathematics Enhancing Classroom Observation Recording System (MECORS)	Uses classroom management techniques	These teaching behaviours and teaching practices were <i>much more consistently used</i> by those teachers who had started using Inspire Maths
	Maintains appropriate classroom behaviour	
	Focuses on and maintains attention on lesson	
	Provides pupils with review and practice	
	Demonstrates skills in questioning	
	Demonstrates MEP strategies	
	Establishes a positive classroom climate	

Differences in Implementation

There were many similarities across classrooms/teachers using Inspire Maths, but some areas of variation (based on field notes):

➤ Mixed ability grouping strategies

- Most teachers were using mixed ability groups/pairs, but varied in the frequency with which they changed groupings, and some specifically avoided pairing pupils of especially high with especially low ability.

➤ Lesson structure

- Some teachers established clear unit routines scaffolding from more practical work on one day to use of practice books at the end of a unit. Others implemented a freer-flowing lesson structure and adjusted plans daily or during lessons based on pupils' progress.

➤ Use of print materials

- Some teachers used practice books and textbooks daily at tables. Others preferred only to project textbook content, or to use some but not all practice book pages.

➤ Use of concrete resources

- Some teachers were prescriptive about which resources pupils used in a given lesson, while others gave pupils a selection of resources from which to choose.

➤ Approach to ongoing assessment/intervention/extension

- Some teachers marked pupil work and gave opportunities for correction in class, and/or pulled small groups to the carpet in response to pupil struggles on the spot. Others marked work after a maths session and structured opportunities for corrections and/or intervention during a separate time in the school day.

Perceived Benefits to teachers

➤ Enthusiasm/confidence

- *“I think has been a better way of approaching my teaching, rather than just showing them an example on the board and, oh, then go and do it. For them having the first hand experience has been, I think it’s been really good for them...”*
(Teacher 18, School G, January start, end of year)
- *“Certainly seeing what Inspire Maths is all about, it’s quite exciting.”*
(Teacher 5, School C, start of year)

➤ Use of mathematical language and questioning

- *“Using the equipment, and asking them questions that I may not have ordinarily asked, is giving me some very creative answers, and I’m finding that really interesting.”*
(Teacher 2, School E, start of year)

➤ Subject knowledge

- *“At the beginning I was not aware of, like, for instance, today’s lesson, I wouldn’t have taught them this kind of method.”* (Teacher 12, School I, end of year)

➤ Planning

- While some teachers found planning challenging, many thought it useful to have the teachers’ guides clearly laid out and to know ‘what comes next’

Perceived Benefits to pupils

- **Development of maths language/vocabulary/verbal reasoning**
 - *“It’s trying to really target those areas, trying to make the children have rich vocabulary experiences”*
(Teacher 7, School E, September start, start of year)
- **Depth/security of understanding**
 - *“We’re not whisking over things that children don’t understand because we’ve got to get ahead, and really spending the time to revisit things, that are not secure yet”*
(Teacher 20, School L, September start, end of year)
- **Engagement and confidence in maths**
 - *“I’d say in general, it appeals to perhaps children that struggle with written work, because it is so practical, so that side of things...really appeals to, to those children.”*
(Teacher 6, School C, September start, end of year)
- **Multiple ways of accessing/representing concepts**
 - *“They’re finding that really beneficial, the use of manipulatives and that’s giving them the confidence then to put that into the abstract”* (Teacher 19, School G, end of year)
- **Multiple approaches to extension and extra challenge**
 - *“It’s nice to have the challenging activities and the ‘Put on your thinking caps’ activities, they’re really useful at the end of a unit, or at the end of a section.”*
(Teacher 8, School A, September start, start of year)
 - *“They’re actually having to explain it to their partners, they’re having to teach it again, so it’s not that I’m not extending them, but I’m extending them in a different way”*
(Teacher 10, School H, end of year)

Perceived Benefits to schools

- **Over and above benefits to pupils and the implications of these as pupils moved up through the school, consistency across classrooms (within and across year groups) was seen as a major benefit of rolling out Inspire Maths.**
 - “Everyone’s saying the use of mathematical language, and that sort of side, is a positive across the school” (Teacher 4, School B, September start, end of year)
 - “Everybody does seem to be very on board with it, I think they’re all keen to find out more about it” (Teacher 5, School C, September start, end of year)
 - “Everyone seems really pleased with it, and I know...the maths lead, is really pleased with how everyone’s taking it on board and running with it. So yeah, it’s good.” (Teacher 8, School A, September start, end of year)

Teachers' views on OUP support

➤ Professional Development (PD)

➤ All teachers had positive comments about PD

- *“I thought it was really good. I thought, erm, what was good was, you could sort of see where it was going, the bigger picture” (Teacher 11, School H, January start, end of year)*
- *“It was quite interactive, quite informative, I really enjoyed it, actually, all the sessions were good. I think the, the practical part was the most useful...” (Teacher 12, School I, January start, end of year)*

➤ All mentioned wanting to see videos or modelling of a full lesson

➤ Some wanted a more specific focus on Year 1 practical activities

➤ Online offerings on Oxford OWL

- Many teachers used the digital versions of textbook pages to display during lessons, but wanted to see more of the textbooks digitised and available online
- Teachers who had drawn on homework content found it useful, but reported certain topics were not covered online
- Access issues and difficulty navigating prevented some teachers from using parts of available online content

Teachers & Schools' future plans

- 85% (17 out of 20) teachers involved in the evaluation were either definitely continuing to use Inspire Maths or thought it likely to continue
- At the final round of teacher interviews (April-May 2016), schools' plans regarding future use of Inspire Maths were reported

	n of schools
Already rolled out in multiple years in 2015-16	2
Committed to rolling out above Year 1 in 2016-17	2
Likely to roll out above Year 1 in 2016-17	5
Undecided (waiting to see results)	1
Unlikely or definitely not rolling out in future	2

Strengths & Limitations of the Evaluation

- RCT and Mixed Methods design based on EER
- Broad scope taking into account multiple dimensions of roll-out:
 - Pupil outcomes, Classroom practices, OUP services (professional development and Oxford OWL)
- Multiple sources and types of evidence:
 - Pupil assessments & questionnaires; Teacher observations & interviews
- Integration: qualitative evidence extends and elaborates on statistical findings to illuminate teachers' experiences and perspectives as well as processes of implementation

BUT

- Relatively small sample 576 Y1 pupils, 20 teachers, 12 schools
- Schools not nationally representative (3 regions but varied contexts ethnic & social diversity)
- No data at pupil level on ethnicity, language or disadvantage to study impact on equity gap
- Study only investigated intervention for Year 1 teachers and pupils , and covered only one school year

Implications for SI policy & practice in schools

- Support from school leadership essential
 - Successful implementation of *Inspire Maths* (or similar materials/approaches) in classrooms may require changes in timetables, resources, and management of physical space that need to be accommodated by school-wide adjustments (e.g. to assembly schedules)
 - Two schools with less fidelity to the intervention and where teachers had less positive views of using *Inspire Maths* were requiring teachers to adhere to other pacing requirements for curriculum coverage and/or teaching approaches
- Curriculum coverage
 - Year 1 teachers may need to cover topics from the National Curriculum at a slower pace to facilitate secure grasp of ‘fundamentals’, so buy-in from school leadership teams and flexibility in policy relevant to the pacing of learning objective coverage may be required to avoid putting competing pressures on teachers
- Change takes time
 - Based on findings from this study, changes in teacher practice (observed and reported) precede changes in children’s knowledge/skills

Future Research Ideas for Inspire Maths

- Do the positive effects on pupil progress and classroom practice persist after Year 1?
 - Does Inspire Maths help boost pupils' scores on later Key Stage 1 National Primary Curriculum Tests?
 - Is improved classroom practice maintained by teachers involved in the Inspire maths programme with subsequent classes?
 - No effects were found for pupil attitudes in this RCT, do any effects emerge later?
- Can Inspire Maths help narrow Equity gaps in attainment for key groups of pupils?
 - e.g. Pupils eligible for Free School Meals (Pupil premium), Pupils with Special Educational Needs; Pupils who speak English as an Additional Language
- Are positive effects on pupil progress and classroom practice replicated when Inspire Maths is implemented...
 - In other school years?
 - In schools located in other parts of the UK?
- Link Inspire Maths approach as a classroom focused SI intervention in terms of the DASI theoretical Model

Significance of School Effects

- Although the differences in scholastic attainment achieved by the same student in contrasting schools is unlikely to be great, in many instances it represents the difference between success and failure and operates as a facilitating or inhibiting factor in higher education
 - ‘When coupled with the promotion of other pro-social attitudes and behaviours, and the inculcation of a positive self-image, the potential of the school to improve the life chances of students is considerable’ (Mortimore 1998)*
- Taken together, the EPPSE examples suggest no single educational influence acts as a ‘magic bullet’ that can overcome disadvantage
- However, supportive educational environments (home learning, pre-school and school) can make a difference to children and young people’s educational outcomes and ameliorate the adverse impact of disadvantage so promoting Equity

Conclusions & Implications (1)

- This lecture has explored the concept of equity in education and implications for EER and SI
- The need to consider different features of effectiveness has been argued including the 'what' 'when' 'who' and 'contextual conditions' of effectiveness linking to WSV
- Research on school composition was noted, what are the implications for those seeking to promote improvement in schools serving high disadvantaged intakes, such as those in this conference?
- EER is paying more attention to theoretical models. The advantage of applying these to guide SI interventions is increasingly recognised, as seen in the Dynamic Approaches model (DASI)
- While classroom/teacher effects are stronger than those of schools in predicting outcomes schools remain important as an influence on both teachers and students and for successful implementation of teaching and curriculum interventions as the Inspire Maths example illustrates

Conclusions & Implications (2)

- Cox (2000) argues that it is the *'multiplicative and interactive'* nature of risk factors that gives the concept of educational disadvantage its complexity
- Individualised, targeted interventions may be needed for those at 'highest risk' whereas supportive educational environments and good teaching across different phases of education may help narrow the gap for those experiencing less complex forms of disadvantage (e.g. students from poor but otherwise stable and supportive families)
- SI initiatives should seek to build on research evidence concerning WSV and differential effectiveness in students' educational experiences and outcomes. How are school & classroom processes shaped by/adapted to serving a high disadvantage student intake?
- Student self-report data can provide valuable evidence about the quality of students' schooling and teaching. Disadvantaged groups often experience poorer quality education. This may compound existing family disadvantage.
- What can we learn from new evidence based on using DASl to enhance both quality and reduce the equity gap in high disadvantage primary schools?

Thank you!

Pamela.sammons@education.ox.ac.uk

For further information about EPPSE & details of project publications visit :

<https://www.ucl.ac.uk/ioe/research/featured-research/effective-pre-school-primary-secondary-education-project>

SELECTED REFERENCES

- Anders, Y., Sammons, P., Taggart, B., Sylva, K., Melhuish, E., Siraj-Blatchford, I. (2011). The influence of child, family, home factors and pre-school education on the identification of special educational needs at age 10, *British Educational Research Journal*, 37(3), 421-441.
- Antoniou, P. and Kyriakides, L. 2011. The Impact of a Dynamic Approach to Professional Development on Teacher Instruction and Student Learning: Results from an Experimental Study. *School Effectiveness & School Improvement*, 22(3): 291–311.
- Charalambous, E., Kyriakides, & Creemers, B. (2016) Promoting quality and equity in socially disadvantaged schools: A group randomised study, *Studies in Educational Evaluation* doi: <http://dx.doi.org/10.1016/j.stueduc.2016.06.001>
- Cox, T. (2000) *Combatting Educational Disadvantage*, London: Falmer Press.
- Creemers, B. P. M., & Kyriakides, L. (2008). *The dynamics of educational effectiveness: A contribution to policy, practice and theory in contemporary schools*. London: Routledge.
- Creemers, B. P. M. and Kyriakides, L. 2010. Using the Dynamic Model to Develop an Evidence-Based and Theory-Driven Approach to School Improvement. *Irish Educational Studies*, 29(1): 5–23.
- Creemers, B. P. M. and Kyriakides, L. 2012. *Improving Quality in Education: Dynamic Approaches to School Improvement*, London and New York: Routledge.
- Creemers, B. P. M., Kyriakides, L., & Sammons, P. (2010). *Methodological advances in school effectiveness research*. London: Routledge.
- Creemers, B.P.M., Kyriakides, L. & Antoniou, P. (2013) [A dynamic approach to school improvement: main features and impact](#), *School Leadership and Management*, 33 (2)
- Danhier, J. & Martin, E. (2014) Comparing compositional effects in two education systems: The Case of the Belgian Communities, *British Journal of Educational Studies*, 62 (2) 171-189.
- Dumay, X., & Dupriez, V. (2008). Does the school composition effect matter? Evidence from Belgian data. *British Journal of Educational Studies*, 56, 440–477.
- Hall, J., Sylva, K., Melhuish, E., Sammons, P., Siraj-Blatchford, I., & Taggart, B. (2009). The role of pre-school quality in promoting resilience in the cognitive development of young children. *Oxford Review of Education*, Vol. 35, pp. 331-352.

- Hall, J., Sammons, P., Sylva, K., Melhuish, E., Taggart, B., Siraj-Blatchford, I., & Smees, R. (2010). Measuring the cumulative risk to children's cognitive development: Confirmatory factor analysis using formative measurement. *British Journal of Developmental Psychology*, 28, 219-238.
- Hall, J., Sylva, K., Sammons, P., Melhuish, E., Siraj-Blatchford, I., Taggart, B. (2013). Can pre-school protect young children's cognitive and social development? Variation by center quality and duration of attendance. *School Effectiveness and School Improvement: An International Journal of Research, Policy and Practice*, 24(2), 155-176.
- Hall, J., Lindorff, A. & Sammons, P. (2016) *Evaluation of the Impact and Implementation of Inspire Maths in Year 1 Classrooms in England*, Department of Education University of Oxford & OUP.
<https://global.oup.com/education/mastery/?region=uk>
- Harker, R., & Tymms, P. (2004). The effects of student composition on school outcomes. *School Effectiveness and School Improvement*, 15, 177–199.
- Kelly, A. (2015) Measuring Equity in Educational Effectiveness Research: the potential and possibilities of quantitative indicators, *International Journal of Research and Methods in Education*, 38(2) 115-136.
- Marsh, H. W., Trautwein, U., Lüdtke, O., Baumert, J., & Köller, O. (2007). Big fish little pond effect: Persistent negative effects of selective high schools on self-concept after graduation. *American Educational Research Journal*, 44, 631–669.
- Marsh, H.W., Seaton, M., Trautwein, U., Lüdtke, O., Hau, K., O'Mara, A. J., et al. (2008a). The big-fish-little-pond-effect stands up to critical scrutiny: Implications for theory, methodology, and future research. *Educational Psychology Review*, 20, 319–350.
- Marsh, H. W., Trautwein, U., Lüdtke, O., & Köller, O. (2008b). Social comparison and big-fish-little-pond effects on self-concept and other self-belief constructs: Role of generalized and specific others. *Journal of Educational Psychology*, 100, 510–524.
- Melhuish, E., Sylva, K., Sammons, P., Siraj-Blatchford, I., Taggart, B. & Phan, M. (2008a), Effects of the Home Learning Environment and preschool center experience upon literacy and numeracy development in early primary school. *Journal of Social Issues*, Vol. 64 (1) pp. 95-114.
- Melhuish, E.C., Sylva, K., Sammons, P., Siraj-Blatchford, I., Taggart, B., Phan, M.B., & Malin, A. (2008b). Preschool influences on mathematics achievement. *Science*, 321(5893), 1161–1162.

- Muijs, D., Reynolds, D. & Kyriakides, L. (2016) The scientific properties of teacher effects/effective teaching processes, chapter 4 IN Chapman, C., Muijs, D., Reynolds, D., Sammons, P. & Teddlie, C. (2016) *The Routledge International Handbook of Educational Effectiveness and Improvement: Research, policy, and practice*, London: Routledge International Handbooks of Education. Pp. 1-572.
- Reynolds, D., Sammons, P., De Fraine, B., Van Damme, J., Townsend, T., Teddlie, C. & Stringfield, S. (2014) Educational effectiveness research (EER): a state-of-the-art review, *School Effectiveness and School Improvement*, 25:2, 197-230.
- Sammons, P. (2010). Equity and Educational Effectiveness. In P. Peterson, E., Baker & B. McGaw (Editors) *International Encyclopedia of Education*, Volume 5 , Leadership and Management – Politics and Governance, (pp 51-57). Oxford: Elsevier.
- Sammons, P., Elliot, K., Sylva, K., Melhuish, E., Siraj-Blatchford , I., Taggart, B., & Smees, R., (2004), The Impact of Pre-School on Young Children’s Cognitive Attainments at entry to reception, *British Educational Research Journal*, Vol. 30 (5), pp 691-712.
- Sammons, P., Siraj-Blatchford, I., Sylva, K., Melhuish, E., Taggart, B. and Elliot, K. (2005), Investigating the Effects of Pre-school Provision: Using mixed methods in the EPPE research, *International Journal of Social Research Methodology, Theory & Practice* special issue on Mixed Methods in Educational Research, Vol. 8, (3) pp. 207-224.
- Sammons, P., Anders, Y., Sylva, K., Melhuish, E., Siraj-Blatchford, I., Taggart, B., Barreau, S. (2008). Children’s cognitive attainment and progress in English primary schools during Key Stage 2: investigating the potential continuing influences of pre-school education. *Zeitschrift für Erziehungswissenschaft Special Edition*, 10, 179–198.
- Sammons, P. , Hall, J. , Sylva, K. , Melhuish, E. , Siraj-Blatchford, I., & Taggart, B. (2013): Protecting the development of 5–11-year-olds from the impacts of early disadvantage: the role of primary school academic effectiveness, *School Effectiveness and School Improvement: An International Journal of Research, Policy and Practice*, 24 (2) 251-268.
- Sammons, P. & Anders, Y. (2015) Researching Equity and Effectiveness in Education: Examples from the UK and Germany, Chapter 7.5 pp 1289-1320, IN Smeyers, P., Bridges, D., Burbles, N. And Griffiths, M. (Eds.) *International Handbook of Interpretation in Educational Research*, Part 2, Springer International Handbooks of Education: Springer: Dordrecht.

Sammons, P. , Toth, K. & Sylva, K.(2015a) *Subject to Background: What promotes better achievement by bright but disadvantaged students?* Report for the Sutton Trust October, London: Sutton Trust.

http://www.suttontrust.com/wp-content/uploads/2015/03/SUBJECT-TO-BACKGROUND_FULL-REPORT.pdf

Sammons, P. , Toth, K. & Sylva, K.(2015b) *Background to Success: Differences in A-Level Entries by ethnicity, neighbourhood and gender*, Report for the Sutton Trust October, London: Sutton Trust.

<http://www.suttontrust.com/wp-content/uploads/2015/11/Background-to-Success-Final.pdf>

Sammons, P., Toth, K., Sylva, K., Melhuish, E., Siraj, I., & Taggart, B. (2015) The long-term role of the home learning environment in shaping students' academic attainment in secondary school, *Journal of Children's Services*, Vol. 10, No. 3, pp189-201.

Sammons, P., Davis, S., & Gray, J. (2016) Methodological and Scientific Properties of School Effectiveness Research: Exploring the underpinnings, evolution and future directions of the field, Chapter 2 IN , *The Routledge International Handbook of Educational Effectiveness and Improvement: Research, policy, and practice*, London: Routledge International Handbooks of Education. pp. 25-76.

Scheerens, J. (2015) Theories on Educational Effectiveness and Ineffectiveness, *School Effectiveness and School Improvement*, 26 (1) 10-31.

Siraj-Blatchford, I., Taggart, B., Sylva, K., Sammons, P., & Melhuish, E. (2008), Towards the transformation of practice in early childhood education: the effective provision of pre-school education (EPPE) project (2008). *Cambridge Journal of Education*, Vol. 38, (1), March, pp. 23-36.

Sylva, K., Siraj-Blatchford, I., Taggart, B., Sammons, P., Melhuish, E., Elliot, K., Totsika, V. (2006), Capturing quality in early childhood through environmental rating scales, , *Early Childhood Research Quarterly*, Vol. 21, pp. 76-92.

Sylva, K., Melhuish, E., Sammons, P., Siraj-Blatchford, I., & Taggart, B. (Eds.). (2010). *Early Childhood Matters: Evidence from the Effective Pre-school and Primary Education Project*. Oxford: Routledge. pp 1-280.

Sylva, K., Melhuish, E., Sammons, P. Siraj-Blatchford, I. Taggart, B. (2011). Pre-school quality and educational outcomes at age 11: low quality has little benefit. *Journal of Early Childhood Research* 9(2), 109–124

Taggart, B., Sammons, P., Smees, R., Sylva, K., Melhuish, E., Siraj-Blatchford, I., Elliot, K., Lunt, I. (2006). Early identification of special needs and the definition of 'at risk': the Early Years Transition and Special Education Needs (EYTSN) Project. *British Journal of Special Education*, 33, 40–45

Group difference in maths knowledge/skills during Year 1 – Inspire Maths Evaluation

	At school entry:					After one term:					After two terms:				
	Model 0	Model 1				Model 0	Model 1				Model 0	Model 1			
<i>FIXED EFFECTS</i>	B	B	SE	p	ES	B	B	SE	p	ES	B	B	SE	p	ES
Average Math Knowledge:	89.40	81.93				94.90	40.92				96.55	34.72			
Experimental Group: Teacher started using <i>Inspire Maths</i> in September? (vs. January)		3.53	0.17	0.303	0.30		-0.40	2.47	0.872	-0.04		3.86	1.80	0.046	0.42
Pupil: Math knowledge at the beginning of this term							0.58	0.04	<0.001	1.61		0.67	0.04	<0.001	1.81
Pupil: Female?		2.57	1.03	0.013	0.22		0.98	0.86	0.255	0.11		-1.92	0.87	0.028	-0.21
Teacher: Years of experience		0.14	0.17	0.404	0.16		0.06	0.10	0.553	0.09		-0.09	0.11	0.401	-0.13
Teacher: Proportion of experience teaching Year 1		0.29	0.61	0.637	0.10		-0.63	0.37	0.104	-0.28		-0.46	0.34	0.191	-0.20
Control measure: Days since the first class received pupil tests, this testing point		0.26	0.17	0.148	0.42		0.15	0.10	0.172	0.30		0.10	0.07	0.160	0.23
Control measure: Days since the first class received pupil tests, last testing point							-0.03	0.11	0.814	-0.06		-0.30	0.10	0.006	-0.60
<i>RANDOM EFFECTS</i>															
Unexplained Child-level Variance	139.91	138.46				136.54	86.29				146.15	85.87			
Unexplained Teacher-level Variance	28.59	22.39				19.73	6.36				22.52	5.35			
Intra-Class Correlation (ICC)	0.17					0.13					0.13				
% of Child-level Variance explained		1%					37%					41%			
% of Teacher-level Variance explained		22%					68%					76%			

Additional Inspire Maths References

Barber, P. & Houssart, J. (2011). Consulting pupils about mathematics: a straightforward questionnaire? In Smith, C. (Ed). *Proceedings of the British Society for Research into Learning Mathematics*. 31(1).

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Hillsdale, N.J.: L. Erlbaum Associates.

Department for Education. (2016, July 12). 8,000 primary schools in England will receive £41 million over 4 years to support the “maths mastery” approach. *School and College Qualifications and Curriculum*. Retrieved from <https://www.gov.uk/government/news/south-asian-method-of-teaching-maths-to-berolled-out-in-schools>

GL Assessment. (2015). *Progress Test in Maths*. Swindon, UK: Author.

Hall, J., Lindorff, A. & Sammons, P. (2016) *Evaluation of the impact and implementation of Inspire Maths in Year 1 classrooms in England*. Oxford: Oxford University Press. Available at: <https://global.oup.com/education/mastery/impact-report?region=uk>

Jerrim, J., & Vignoles, A. (2016). The link between East Asian “mastery” teaching methods and English children’s mathematics skills. *Economics of Education Review*, 50, 29–44.

Ministry of Education. (2012). *O-level teaching and learning syllabus*. Singapore: Author.

Schaffer, E., Muijs, D., Kitson, C., & Reynolds, D. (1998). *Mathematics enhancement classroom observation record*. Newcastle, UK: University of Newcastle, School of Education

Teddlie, C., Creemers, B., Kyriakides, L., Muijs, D., & Yu, F. (2006). The international system for Teacher Observation and Feedback: Evolution of an international study of teacher effectiveness constructs. *Educational Research and Evaluation*, 12(6), 561–582.

van de Grift, W. (2007). Quality of teaching in four European countries: a review of the literature and application of an assessment instrument. *Educational Research*, 49(2) 127-152.

Vignoles, A., Jerrim, J. & Cowan, R. (2015). *Mathematics Mastery: Primary Evaluation Report*. London: Education Endowment Foundation. 49(2), 127–152.