*The Irish Journal of Education, 2020, xliii, pp. 30-60.*

# A REVIEW OF THE SCHOOL EFFECTIVENESS LITERATURE: LESSONS FOR IRELAND

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This paper provides an introduction and review of some of the main findings from the international literature on school and teacher effectiveness and discusses the relative merits of several alternative approaches to judging 'effective schools'. The assessment of school effectiveness in the Irish context is considered, particularly in light of the relatively low variance in achievement outcomes that is generally found between schools in Ireland. Finally, some conclusions are drawn, and a number of related issues are raised for the reader's consideration. These include the importance of the home environment and early learning for later achievement outcomes, and the inclusion of non-cognitive and non-achievement outcomes in discussions of school effectiveness.

The contribution of schools to student achievement has been a subject of study for more than half a century. A landmark report by Coleman et al. (1966, p. 325) concluded that "schools bring little influence to bear on a child's achievement that is independent of his background and general social context". Furthermore, it argued that, of all school-level factors, the social composition of the school's intake is the most important correlate of achievement. Since then, considerable efforts have been made to determine whether or not schools have an influence on student achievement over and above the influence of home background, and if they do, the ways in which schools achieve this influence.

Since the work of Coleman et al., the field of study has grown into educational effectiveness research (EER) and related fields (e.g., school improvement research) facilitated by the development of more sophisticated statistical methods such as multilevel modelling (e.g., Goldstein, 2003). EER studies have become more common, sometimes incorporating the traditionally-distinct domain of school improvement (Reynolds et al., 2014). Evidence gathered over recent decades suggests that schools and teachers make a difference over and above home background. Often, schools that are effective in one area tend to be effective in others (see Teddlie & Stringfield,

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1993) and school effects tend to be relatively stable over a few years (Doolaard, 2002; Smyth, 1999).

Academic achievement in subjects such as reading and mathematics is the outcome measure most commonly studied in effectiveness research. Much more limited attention has been given to non-cognitive or non-academic outcomes (but for exceptions see e.g., Clerkin, 2016; Smyth, 1999; Van de gaer et al., 2009; Van Landeghem, Van Damme, Opdenakker, De Fraine & Onghena, 2002). Although school effects tend to be smaller for non-cognitive outcomes, it is important that the broader purposes of schooling are not overlooked when considering what constitutes an 'effective' school. In Ireland, for example, the current Junior Cycle Framework (DES, 2015) explicitly places a strong focus on student wellbeing. Although the primary focus in the current paper is on between-school differences in cognitive outcomes such as reading and mathematics achievement, the authors acknowledge the importance of non-cognitive outcomes of schooling and recognise that for parents choosing schools, academic outcomes are just one of a number of factors affecting school choice (see, e.g., Growing Up in Ireland, 2013).

Despite the extensive body of literature generated in the EER field, there appears to have been limited uptake by policy makers internationally, although the discipline has had some influence on school inspection systems in the United States, England and the Netherlands (Reynolds et al., 2014). Currently, Wales is one of the few countries to make systematic uses of EER findings. Reasons put forward by Reynolds et al. (p.217) to explain this limited uptake are:

- The level of statistical knowledge required to interpret EER findings;
- The desire of policy-makers to focus on school-level effects rather than classroom-level variables (whereas EER argues for the primacy of teacher effects);
- A reluctance to develop contextually-specific policies;
- The most obviously leverageable variables are not those that have the strongest associations with achievement; and
- Unpopular findings (politicians prefer to focus on popular initiatives).

The first section of this paper provides an overview of the field of educational effectiveness research. In the second section, attention is given to methods used to draw distinctions between schools on the basis of performance. Such methods for comparing and ranking schools on the basis of performance are often a feature of neoliberal, market-orientated approaches to school accountability. These value-added modelling (VAM) approaches have

been widely employed in England and the US to identify effective and ineffective schools, where effectiveness is defined on the basis of student academic achievement. The appropriateness, or otherwise, of these methods in the Irish context is considered. The third section focuses specifically on the Irish context and discusses how student achievement varies across schools in Ireland. Finally, conclusions are presented which highlight the need for policy interventions addressing disadvantage to focus not only on the school level but also on home processes such as leisure reading.

## OVERVIEW OF EDUCATIONAL EFFECTIVENESS RESEARCH

Creemers et al. (2013) describe a multilevel framework for educational effectiveness research, which they term the Dynamic Approach to School Improvement (DASI). Their model focuses attention on the ongoing interactions between various factors at the level of individual students (e.g., gender, motivation, opportunity to learn), classrooms (e.g., teachers' time management, use of questioning or modelling, structure of lessons), and schools (e.g., school policies, leadership, school climate), all nested within the broader educational and social system (e.g., national education policies, evaluation of educational outcomes, societal attitudes to education). These factors are expected to operate both within and between each of the hierarchical levels, and a comprehensive account of educational effectiveness should take account of these dynamic interactions.

An extensive EER literature has been generated on important school-level factors. Summarising this literature, Teddlie and Reynolds (2000) list nine factors that are characteristic of 'effective' schools:

- Effective leadership;
- A focus on learning;
- A positive school culture;
- High expectations of students and staff;
- Monitoring progress at school, classroom, and student levels;
- Involving parents;
- Generating effective teaching;
- Professional development of staff; and
- Involving students in the educational process.

A large body of evidence suggests that effective schools demonstrate some or all of these characteristics, although the specifics may vary in different countries. Reynolds et al. note that while there is greater consistency in the

teacher-level and instructional factors associated with effective schools across countries, the specifics of school-level factors vary internationally. For example, although school leadership is found to be an important feature of effective schools across countries, the distinctive characteristics of effective leadership (e.g., directive versus lateral/vertical) vary across different contexts. Muijs, Harris, Chapman, Stoll and Russ (2004) consider how the characteristics associated with effectiveness vary depending on the presence or absence of socioeconomic disadvantage. They cite a number of factors that underpin school improvement specifically in disadvantaged areas:

- A focus on teaching and learning;
- Leadership;
- Creating an information-rich environment; i.e., making use of a wide variety of data, such as examination results, standardised and teacher-made test results, questionnaires, and qualitative data;
- Creating a positive school culture;
- Building a learning community;
- Continuous professional development (CPD) that is linked to school goals and embedded in the workplace;
- Involving parents (which is argued to be one of the most challenging areas of school improvement in economically deprived areas);
- External support, e.g., from a school network; and
- Resources.

Much of the literature on which Muijs et al. base their conclusions is based on studies conducted in the North American context. The extent to which this research is generalisable to other national contexts is unclear. While the same factors may be associated with effective education in Ireland, there is likely to be considerable variation in how these factors are best realised in the Irish context. Muijs et al. also note that the level of emphasis most appropriately placed on each of these variables may depend on the improvement phase of the school. For example, in an early phase of school improvement there may be a need for directive leadership, whereas distributed leadership may be more effective in later stages. It is thus very difficult to be prescriptive about creating effective schools.

The OECD's Teaching and Learning International Survey (TALIS), in which Ireland participated in 2008, examines cross-national variation on many of the measures associated with effective schools. TALIS is an international, large-scale survey that explores teachers' working conditions and the learning environment in schools at post-primary level. Topics for inclusion in the

survey were identified on the basis of research findings on the characteristics associated with effective schools and teachers. TALIS defines an effective teaching and learning environment as one that contributes to student learning (OECD, 2014, p.28). Some of the findings for Ireland from TALIS will be explored later in this paper.

Teacher effects (as distinct from school effects) have also received some attention in the literature, and it has been suggested that these exceed school effects when progress over time is taken into account. Some of the characteristics of effective teachers that have been identified (Reynolds et al., 2014) include:

- the richness of instructional methods;
- productive use of instructional time;
- teacher sensitivity to students' needs;
- having a supportive lesson climate;
- proactive classroom management;
- clarity of objectives and well-organised lesson structure;
- environmental and teacher support;
- engaging students with assignments and activities;
- positive behaviour management;
- purposive learning;
- high quality questioning and feedback for students; and
- lack of teacher detachment (examples of detachment include teachers staying and working at their desks, not offering feedback, or not noticing children's behaviour or needs);

The extent to which the role of each of these factors is constant across contexts is open to question. However, Reynolds et al. suggest that there is increasing evidence pointing towards a need for a differentiated account of 'good teaching' that takes into account differences between subjects, by students' socioeconomic backgrounds.

In the Irish context, McCoy, Smyth and Banks (2012; see also Clerkin, Perkins & Chubb, 2017) report that children in DEIS Band 1 primary schools are significantly less likely to have teachers who use active teaching methods (i.e., pair work, group work, asking other pupils questions, hands-on activities, pupils finding out for themselves, and play used to facilitate learning) compared to children attending non-DEIS schools, and they suggest that this may be a consequence of greater use of established literacy and numeracy programmes in the disadvantaged context. They show that the teaching

methods used by teachers are related to numerous factors such as teacher gender and experience, and contextual factors such as class size and the presence of pupils with learning disabilities. It is not possible to determine from the work of McCoy et al. whether teachers (or school management) in DEIS Band 1 schools in Ireland had selected more teacher-directed approaches because they believed these to be most appropriate in their particular context, or if contextual issues (e.g., lack of space or resources) constrained the use of more active approaches.

McCoy et al. also report that even having controlled for teacher and other school characteristics, there is some evidence that DEIS Band 1 schools spend somewhat less time on the teaching of Irish and somewhat more time on the teaching of English and SPHE than non-DEIS schools. While it has been argued in the literature that a focus on basic skills is of particular importance in disadvantaged schools, a danger with this approach is that the curriculum becomes impoverished and social divides are exacerbated rather than diminished (Muijs et al., 2004).

Data from large-scale international assessments offer some opportunities to consider the extent to which the characteristics of effective schools, teachers and classrooms persist across countries. Studies of school effectiveness have used data from studies including the Trends in International Mathematics and Science Study (TIMSS; Martin, Mullis, Foy, & Hooper, 2016; Mullis, Martin, Foy, & Hooper, 2016), the Progress in International Reading Literacy Study (PIRLS; Mullis, Martin, Foy, & Hooper, 2017), and the Programme for International Student Assessment (PISA; OECD, 2015). As Ireland has participated in several cycles of these studies, Irish data have been included in some school effectiveness analyses arising from these data. The most commonly-used measure of school effects is the intra-class correlation (the percentage of variance in the student outcome under consideration that can be attributed to the school).

Martin, Foy, Mullis and O'Dwyer (2013) use combined data from TIMSS and PIRLS to examine the school characteristics associated with achievement at primary level in reading, mathematics and science, after controlling for several home background factors. Their study is based on a conceptual framework of school effectiveness that considers effective schools to:

- be safe and orderly;
- support academic success;
- have adequate facilities and equipment;
- be staffed with well-prepared teachers;

- have well-resourced classrooms; and
- provide effective instruction.

Based on this framework, five measures of school effectiveness were included as predictors: three indicators of *effective school environment* (schools are safe and orderly; schools support academic success; schools have a physical environment and resources that are adequate for learning) and two indicators of *effective school instructio*n (early curricular emphasis on higher order reading processes; students are engaged in reading, mathematics, and science lessons). Two measures of home background (home resources for learning; pupil could accomplish early literacy and numeracy tasks when entering school in First grade) were included as control variables. The study used multilevel models to examine how the characteristics of effective schools were associated with achievement in reading, mathematics and science, both before and after controlling for home background at student- and school-level. For each participating country, separate models were developed for reading, mathematics and science.

Of the 32 countries included in the analyses, the authors identify seven as having particularly low between-school variance in achievement (Table 1) and conclude that "there is little scope for relationships between school characteristics and achievement at the Fourth grade in the data from these countries. School effectiveness analyses in countries such as these are limited in the information they can provide about characteristics of effective schooling" (Martin et al., 2013, p. 136). Although not specifically listed as one of the countries with low between-school variance, levels of between-school variance in Ireland (12% in reading, 17% in mathematics, and 19% in science) were not too dissimilar to those in the countries identified by Martin et al. (Table 1). Detailed discussion of between-school variance in Ireland is provided later in this paper.

Caponera and Losito (2016) have also used data from TIMSS to study the association between student achievement and factors related to the school context in post-primary schools, although their analyses did not include Irish data. Their findings emphasised the well-described associations between achievement and student and school SES. Differences in achievement associated with SES were found to be greatest in the least equitable countries (those with a wider gap between rich and poor as measured by the Gini coefficient). Their results also showed some variation between high- and low-

Table 1
*Percentages of Variance in Reading, Mathematics and Science Achievement between Schools in Countries Identified by Martin et al. (2013) as Having Low Between-school Variance, and Percentages for Ireland*

| | Reading | Mathematics | Science |
|---|---|---|---|
| Austria | 9 | 16 | 13 |
| Chinese Taipei | 10 | 11 | 10 |
| Croatia | 10 | 13 | 11 |
| Finland | 7 | 9 | 10 |
| Norway | 8 | 14 | 9 |
| Poland | 10 | 13 | 11 |
| Slovenia | 5 | 8 | 8 |
| Ireland | 12 | 17 | 19 |

Based on Exhibits 3.2, 3.3, and 3.4 in Martin et al. (2013).

SES schools in the associations between achievement and school-level variables. This may suggest that for a school to be effective, it needs to adapt its methods and procedures to suit the local context; i.e., there may be positive associations between achievement and school process variables in a high-SES context that are not transferable to a low-SES context, and vice versa. The findings of Caponera and Losito can be related to those of Muijs et al. (2004), who also found some evidence that effectiveness in low-SES schools is linked to particular factors that distinguish them from high-SES schools, with differences in the most effective instructional strategies in the two contexts, relations with parents, and the need for external support. Such detailed analyses of the interplay between school-level SES and other process variables are important to avoid simply 'bracketing off' social class processes in school effectiveness research (Slee & Weiner, 1998) and in subsequent recommendations for practice.

Data from PISA have also been used to examine the characteristics of effective schools at post-primary level. Findings show that after controlling for student and school socio-economic background, higher achievement on PISA is found in schools with less incidence of student truancy and in schools with better disciplinary climate (OECD, 2013a). These analyses also confirm the importance of having adequate educational resources, and emphasise that the relationship between school autonomy and performance is complex. However, Marks (2010) has used Australian PISA data to examine the aspects of schooling that are associated with entrance to tertiary education. He found comparatively few significant factors at school level and suggests that: "in order to improve the outcomes of disadvantaged groups (weaker achievers or

students with low socioeconomic backgrounds), the policy focus should be on individual students in need of assistance rather than the schools they attend, because such students are not limited to a small number of schools with particular characteristics" (p.282). Similarly, Aloisi and Tymms (2017, p.206), reviewing changes in PISA trends from 2000 to 2015, conclude that there is "more evidence pointing towards a strong relationship between the socioeconomic and demographic characteristics of the PISA population and country outcomes than evidence in favour of the effectiveness of education policies such as reforms of the school curriculum." They note that their claim does not imply that countries should not engage in curricular reform or invest in other policies, but that "there needs to be an expectation that the payoff, at least on a national scale, will be small and incremental, rather than large and frequent."

## METHODS FOR IDENTIFYING EFFECTIVE AND INEFFECTIVE SCHOOLS

In some countries, a neoliberal perspective informs approaches taken to monitoring the performance of schools and teachers, with advocates of these approaches suggesting that they help promote school accountability and help parents to make informed choices when choosing schools. England and the US have been to the forefront in using sophisticated statistical methods to draw comparisons between schools (and between teachers, in the USA) and making results of such analyses publicly available. 'Effective' schools are described as those where achievement levels are highest and/or where students make greater than expected levels of progress, given their social background.

Coming from a US perspective, Sloane, Oloff-Lewis and Kim (2013, p.39) assert that "there is considerable agreement that monitoring schools based on unconditional mean school performance or the percentage of students proficient does not hold schools accountable for processes for which they ought to be held accountable and tends to place diverse schools at a disadvantage". However, this is not a universally held position. In 2011, policy makers in England ended the use of methods which ranked schools on the basis of performance after adjusting for student socioeconomic and demographic background, in favour of a new ranking system using unadjusted achievement data. A threefold rationale for ending the use of contextual value-added measures was provided. Firstly, such measures were deemed difficult for the public to understand; secondly, they were purported to be a weaker predictor

of success than raw attainment measures; and thirdly, they were argued to have the effect of lowering expectations for pupils from certain ethnic backgrounds or with particular family circumstances (DfE, 2010). Leckie and Goldstein (2017) consider each of these rationales and question the justification for moving away from contextual value-added measures. In 2016, progress measures in England were again revised but continue to disregard socioeconomic background, although they do now take pupils' prior attainment into account.

Value-added models (VAM) offer an alternative to comparing schools on the basis of raw performance scores. In essence, such models make use of a pre-test and a post-test score for each student and examine the change in performance over time. They may or may not take into account demographic and contextual factors. Sloane et al. (2013) provide a review of six different basic types of VAM. These vary in a number of important ways, including:

- the number of achievement measures incorporated for each student;
- the number of content areas included;
- the number of student cohorts involved;
- whether or not teacher effects are considered to persist or diminish;
- whether or not assumptions are made about linear student growth;
- how missing data are treated;
- whether or not student demographic characteristics are included;
- consideration of students' previous education experiences; and
- consideration of family inputs.

The simplest 'gain score model' links the gain made by a student in one year to that student's teacher (Sloane et al., 2013). Gains for all students of one particular teacher are averaged and that average represents the gain score of the particular teacher which can be compared, for example, to the average gain score of all teachers in a city. The simplicity of the model, as well as other shortcomings, make it unsuitable for high-stakes decisions, although it could be useful in low-stakes decisions such as identifying schools for awards (Sloane et al., 2013).

The covariate adjustment model is an extension of the gain score model. It allows for adjustments based on student characteristics and for the persistence of teacher effects to be estimated. An example is the Dallas value-added assessment system and again, limitations of this type of model render it most suitable for low-stakes decisions such as designing school improvement plans (Sloane et al., 2013).

Further extensions include the layered model (also called EVAMS [educational value-added assessment system], used to measure educational outcomes in Tennessee and widely used elsewhere), the cross-classified model, the persistence model, and the cumulative within-child mixed-effects model. These models constitute foundational models which serve as the basis for 'next-generation' approaches (Sloane et al., 2013). In terms of considering the introduction of any such approaches to the Irish context, Sloane et al. argue for policy makers to be "extraordinarily careful" as "it is highly unlikely to improve the lives, or the learning, of teachers and their students" (p.65). This issue is revisited in the conclusion to this paper.

While teacher effects receive considerable attention in the US, England focuses on ranking schools on the basis of performance. Contextual value-added models (CVA), i.e., models adjusting for student background, were used for ranking schools on the basis of performance between 2006 and 2010 in England. Leckie and Goldstein (2017) provide a discussion of the evolution of performance measures in England from 2002 onwards. They argue cogently against the omission of pupil socioeconomic and demographic information from the then current measure of school progress and suggest that more socioeconomically advantaged schools benefit most from the latest measure as socioeconomic advantage in confounded with any true influence of the school. They conclude that "all these progress measures and school league tables more generally should be viewed with far more scepticism and interpreted far more cautiously than they have often been to date" (p.209). While they argue that contextual value added measures are preferable to models that fail to take into account student background, they suggest that caution is needed even with these as schools may be differentially effective[1] for different groups of students (e.g., pupils with special educational needs, those from different ethnic backgrounds, or for girls or boys). Caution regarding naive interpretations of league tables or similar methods of ranking schools or judging progress seems especially warranted in light of recent findings from Gorard and Siddiqui (2018). These indicate that student achievement in English grammar schools is no better than would be expected based on the characteristics of their intake, despite political support for the view that (selective) grammar schools produce superior results to non-selective schools.

Leckie and Goldstein (2017) compared the school rankings produced by two school progress measures (CVA and Expected Progress [EP]) and found

[1] Sammons and Luyten (2009, p.135) define differential effectiveness as 'internal variation in results for subgroups of students'.

low correlations between the two rankings (see also Goldhaber, Goldschmidt & Tseng, 2013). A school's CVA score was calculated using a multilevel model, computed as the average of the difference between actual and predicted GCSE scores, with a pupil's predicted score calculated as a function of his/her prior attainment, age, gender, ethnicity, socioeconomic status and various other school and pupil characteristics. EP is calculated as "the percentage of pupils in each school who 'make the progress expected of them' during secondary schooling, defined for all pupils as three (or more) national curriculum levels" (p.196). EP does not take into account pupil socioeconomic or demographic background. Also, it appears harder for low prior attainers to make the expected level of progress compared with high prior attainers. Thus, EP is strongly biased in favour of schools with high prior-attaining intakes and more socioeconomically advantaged students. Across 3,056 secondary schools in 2010, the Pearson correlation between CVA and EP for English scores was 0.36. The corresponding value for mathematics was 0.29. While 15% of schools were classified as 'underperforming' using EP, Leckie and Goldstein show that just 10% would be classified as underperforming using the CVA system.

An important point to note from the Leckie and Goldstein analysis is that while prior attainment is likely associated with socioeconomic status, prior attainment alone is not sufficient as a background measure in calculating a measure of school performance. More detailed contextual information such as gender, ethnicity and socioeconomic status is needed if fair comparisons are to be made between schools. Deciding which variables should be included and excluded is not a simple matter (Dearden, Miranda & Rabe-Hesketh, 2011).

Although variations of value-added models are by far the most widely used for school accountability purposes, Luyten, Tymms and Jones (2009) present a regression-discontinuity model which makes use of cross-sectional data. Their approach allows estimation of the absolute effect of one year of schooling and an estimate of the variation across schools of this effect. It makes use of the fact that students are assigned to a higher or lower grade on the basis of their date of birth (e.g., September 1st in England). Thus, students born just before the cut-off are in the higher of two grades while students born just a few days later, after the cut-off, are in the lower grade. Broadly, achievement differences between the oldest pupils in the lower grade and the youngest ones in the upper grade are attributed to the effect of an extra year of schooling. In order for regression-discontinuity models to work, adherence to the cut-off

point is essential; i.e., retention of students will cause students to be in the 'wrong' grade for their birthday.

In Ireland, the regression-discontinuity approach is unlikely to be fruitful for two reasons. Firstly, there are no strict national cut-off points for grade assignment on the basis of age (see Table 2.7, McGinnity, Russell & Murray, 2015). Secondly, school starting age is associated with socioeconomic status (McGinnity et al., 2015) but regression discontinuity models depend on the selection criterion (i.e., age) being the only relevant difference between the treatment and control groups.

Other important methodological developments which have facilitated progress in educational effectiveness research, as identified by Reynolds et al. (2014), include structural equation modelling, meta-analytic techniques, and growth curve modelling (which requires longitudinal outcomes from three or more time points).

An important caveat that applies to any form of value-added modelling is that it is generally intended to compare the outcomes of a school with a set of characteristics X *relative to* other schools with characteristics Y (or not-X). This means that the effectiveness of a school is conceptualised in such models in a comparative framework – i.e., a school may be regarded as more or less 'effective' *relative to* other schools. One implication of this approach is that it is possible that all schools could make progress on a given outcome indicator over time, but those making the least progress would be ranked lowest in terms of 'effectiveness' (despite making improvements in absolute terms). It is therefore important to consider carefully how effectiveness could most usefully be demonstrated in a local context, given the intended use of the data for policy or practice. Are users most interested in monitoring effective practices in terms of growth over time (e.g., schools that show the strongest proportional improvement within a set period) or in terms of absolute attainment (e.g., schools with the highest proportions of students reaching given benchmarks or norms of achievement, controlling for background characteristics)?

## SCHOOL EFFECTIVENESS AND DIFFERENCES BETWEEN SCHOOLS IN IRELAND

Although the Education Act (Government of Ireland, 1998) precludes the publication of school league tables in Ireland, recent years have seen an increased focus on school accountability (for a review, see Conway & Murphy,

2013). Reports on Whole School Evaluations (WSEs) have been published by the Department of Education and Skills since 2006, while schools are also required to engage in self-evaluation processes. The National Literacy and Numeracy Strategy (DES, 2011) refers to gathering and using assessment data at the level of the individual student, the school and the education system. League tables of the 'best performing' or 'most improved' post-primary schools, based on the percentage of students subsequently enrolling in third-level courses, are now published by a number of newspapers each year.

One of the earliest school effectiveness projects in Ireland compared student performance on standardised tests with their performance on their Intermediate Certificate examination (Madaus, Kellaghan, Rakow & King, 1979). Findings showed that curriculum-based tests are more strongly associated with school characteristics than are standardised tests; i.e., classroom-related variables explained a greater proportion of variance in examination performance than in standardised test performance. Their findings show that, while school factors tended to explain variance in Intermediate Certificate performance, variance in standardised tests was better explained by individual factors, in particular IQ. This illustrates the crucial importance of giving careful consideration to the outcome measure (in this example, *academic performance as judged by standardised test scores* vs *academic performance as judged by State examination performance*) if the aim is to explain variance using school or classroom variables.

Major changes have taken place in the Irish education system since the work of Madaus et al., including large improvements in retention rates to the end of second-level education and the replacement of the Intermediate Certificate examination by the Junior Certificate examination (and, more recently, by the Junior Cycle Profile of Achievement). Therefore, it is useful to consider more recent estimates of between-school variance in various subjects. Cosgrove (2005) carried out a review of between-school variance in Ireland on various national and international studies. More curriculum-sensitive measures were found to be associated with higher between-school and between-class variance than standardised test measures. Cosgrove cites estimates of between 18% and 27% for between-school variance in Junior Certificate English and estimates of between 16% and 27% for Junior Certificate mathematics. The lower values were reported in a sample-based study of 3,854 students in 139 second-level schools (Sofroniou, Shiel & Cosgrove, 2000) while the higher values were based on analyses of population data of about 63,000 students in 738 schools (see Cosgrove, 2005). Based on

an average performance measure across Junior Certificate subjects, Smyth (1999) reports between-school variance in Junior Certificate achievement of 22% (the corresponding value for Leaving Certificate achievement was 20%). Using a measure similar to that reported by Smyth and data from 2009, Gilleece (2014) reports that 30% of the variance in Junior Certificate achievement was accounted for by differences between schools.

Sloane et al. (2013) urge extreme caution regarding any introduction of value-added modelling to Ireland, despite calls by the OECD (2011) for systematic evaluation of teacher and school performance in Ireland and for the publication of school performance information (after adjusting for student socioeconomic background). The main arguments in favour of such a move have been to promote accountability and to provide parents with greater information to inform school choice.

Gilleece (2014) used a contextualised attainment model (CAM) to examine school performance on the 2009 Junior Certificate examination. This is a cross-sectional multilevel model that has the advantage of having background and achievement data at the individual student level, but with the limitation of not taking prior attainment into account. In the absence of information on prior attainment, CAMs have been argued to be a fairer way of assessing school performance than using raw achievement scores only (OECD, 2008). In Gilleece's study, the student-level explanatory variables used were gender and SES (indicated by students' holding an examination fee waiver, which is available to students in possession of a medical card). A limitation of the SES measure is that it is relatively undifferentiated (i.e., it is a dichotomous indicator, not a continuous measure of SES). School-level explanatory variables used were: school location; percentage of students with an examination fee waiver; percentage female enrolment; school participation in the School Support Programme under DEIS; school language of instruction (English or Irish); and, fee-paying status.

Having adjusted for these explanatory variables at the student and school levels, findings showed significantly lower than expected Junior Certificate performance in 18% of schools and significantly higher than expected performance in a further 18% of schools (Gilleece, 2014). A noteworthy finding is that a correlation of just 0.47 was found between school rankings on the basis of raw achievement results and those on the basis of model results. This indicates that raw achievement results are likely to give a misleading impression of school effectiveness if used in isolation. Gilleece notes that the inclusion of fee-paying status and language of instruction as statistically

significant school-level variables in her model may be indicative of an insufficiently differentiated measure of SES at student level, as other studies have shown these variables to be closely related to SES (e.g., Gilleece, Shiel, Clerkin & Millar, 2012) and they may be acting as SES proxies here. The issue of spurious school composition effects as a consequence of poorly-specified (or insufficiently differentiated) data at the individual level has been addressed in the literature (e.g., Harker & Tymms, 2004). Relatedly, it has been argued that school composition effects are more appropriately investigated in longitudinal, rather than cross-sectional, studies (Verhaeghe, Van Damme & Knipprath, 2011) (see discussion in conclusions section of this paper). However, longitudinal studies are comparatively rare in the extant literature.

It was noted earlier that findings from TIMSS 2011 and PIRLS 2011 showed that at primary level, between-school variance in reading (12 percent), mathematics (17%) and science (19%) achievement in Ireland is comparatively lower than in many other countries and on average internationally (international averages for reading, mathematics and science are 22%, 26%, and 25%, respectively) (Cosgrove & Creaven, 2013). These values are broadly comparable to those reported in national assessments of reading and mathematics at primary level, where between-school variance accounted for 12 to 15% of the total variance in reading achievement and 21% of the total variance in mathematics achievement (Table 2).

At post-primary level, trends in between-school variance since 2000 can be monitored using results from PISA (note that the OECD reports between-school variance only for the major assessment domain in each cycle). In Ireland, between-school variance in reading has fluctuated between 13 and 29 percent of the total variance. However, given that performance in Ireland in 2009 may be considered atypical[2], it may be more useful to consider between-school variance in reading achievement to range between 13 and 24% in Ireland. These values are low by international standards and indicate that between-school variance in reading achievement in Ireland is about half to three-quarters what it is internationally, on average. Values for between-school variance in Ireland range between 15 and 19% (excluding 2009) for mathematics and between 14 and 20% for science (Table 2). Again, these figures are lower than the corresponding international averages. A likely reason for higher between-school variance in some other countries is the

[2] This issue has been extensively studied and numerous hypotheses advanced to explain changes in performance in 2009; see e.g., Cosgrove & Cartwright, 2014; Cosgrove, Shiel, Perkins & Moran, 2010.

greater use of tracking, where second-level students in some countries (e.g., Germany) choose vocational or academic tracks at a comparatively young age.

Although not particularly evident in Table 2, it is common to find higher levels of between-school variance in mathematics or science than in language achievement (Sammons & Luyten, 2009). There is some evidence of this at primary level in Ireland from the 2009 National Assessments, where variance between schools accounted for 15% of the variance in reading achievement compared to 21% of the variance in mathematics, and from PIRLS and TIMSS 2011, where between-school variance in mathematics and science was substantially higher than for reading (Table 2).

Small differences can be noted in the literature between reported values for between-school variance for a particular data set. These can arise as different authors use slightly different approaches and software packages (for example, variance can be computed with or without the use of sample weights). Furthermore, OECD publications (e.g., OECD, 2013b) report an index of academic inclusion calculated as (100*(1-rho)).[3] Therefore, between-school variance is not directly reported but can be easily calculated by computing rho, although rounding error will likely lead to a slightly different value than if rho is computed directly from data. Due to rounding, the values reported in Table 2 should be taken as being indicative of differences between-schools in Ireland and illustrative of general trends rather than as absolute measures of between-school differences.

The sampling approach used may also have an important impact on estimates of between-school variance. Whereas PISA uses an age-based sample, both the National Assessments and IEA studies such as TIMSS and PIRLS sample intact classes. If students are assigned to classes systematically on the basis of achievement (e.g., streaming or setting), between-school estimates of variance in achievement may be inflated.

[3] The rho statistic denotes the magnitude of the intraclass correlation of the outcome measure in question; that is, the degree of variation between clusters.

Table 2
*Percentages of Variance in Reading, Mathematics and Science Achievement between Schools in Ireland and Internationally*

| | Reading | | Mathematics | | Science | |
|---|---|---|---|---|---|---|
| | IRL | INT Avg | IRL | INT Avg | IRL | INT Avg |
| **Primary** | | | | | | |
| NA 2014[a] | 12 | – | – | – | – | – |
| NA 2009[b] | 15 | – | 21 | – | – | – |
| Growing Up in Ireland[c] | 10 | – | 12 | – | | – |
| PIRLS[d] & TIMSS 2011[e] | 12 | 22 | 17 | 26 | 19 | 25 |
| **Post-primary** | | OECD Avg | | OECD Avg | | OECD Avg |
| PISA 2015[f] | 13 | – | 15 | – | 14 | 30 |
| PISA 2012[f] | 24 | – | 19 | 36[g] | 20 | – |
| PISA 2009[f] | 29 | 39 | 24 | – | 25 | – |
| PISA 2006[h] | 23 | 36 | 19 | 35 | 17 | 33 |
| PISA 2003[h] | 23 | 31 | 17 | 33 | 16 | 30 |
| PISA 2000[h] | 18 | 35 | 11 | 31 | 14 | 31 |

[a] National Assessments 2014: Findings of a three-level analysis of variance (unweighted) in *schools with two participating classes* (i.e., excluding schools that only had one participating class) showed about 1% of variance between schools, less than 2% of variance between classes and about 84% of variance within classes (Kavanagh, Shiel, Gilleece, & Kiniry, 2015).
[b] National Assessments 2009: Gilleece, Shiel, Clerkin & Millar (2012).
[c] McCoy, Quail & Smyth (2014).
[d] Cosgrove & Creaven (2013).
[e] Martin et al. (2013).
[f] Shiel, Kelleher, McKeown & Denner (2016).
[g] Based on Figure 11.5.1b, OECD (2013b).
[h] Perkins, Shiel, Merriman, Cosgrove & Moran (2013).

Numerous studies of achievement in Ireland have failed to find many significant school-level variables once student-level variables have been included in multilevel models, with school average SES often the only significant school-level variable. This is not surprising given the comparatively low between-school variance observed in Ireland (Table 2).[4] For example, in their work on PIRLS and TIMSS 2011, Cosgrove and Creaven (2013) found

[4] In other words, if there is little variation to explain in an outcome then it is unlikely that strong predictors of variation will be found.

just one school-level variable (average pupil age) that was significantly associated with all three outcome measures (reading, mathematics and science). School enrolment size was significantly associated with mathematics and science (with the advantage primarily for pupils in small schools) but not reading. School language of instruction and school emphasis on academic success were significantly associated with reading achievement (but not mathematics or science) and parental support was significantly associated with mathematics achievement (but not reading or science). Ongoing work on the DEIS evaluation similarly suggests that few school-level variables are significant predictors of achievement once pupil-level variables are accounted for in a multilevel framework (Kavanagh & Weir, 2018). Consistent with Cosgrove and Creaven's findings, the DEIS data provide rich and detailed information on school context and processes, yet the more important predictors of achievement appear to be pupil demographic and home background characteristics.

Using Junior and Leaving Certificate examination data from 1994 and 1996, Smyth (1999) considered the effectiveness of post-primary schools in Ireland. Her conclusions emphasise the difficulties associated with any such exercise, given that schools may not be equally effective for different groups of pupils (e.g., different ability levels, boys or girls). Findings show that schools varied more in the academic performance of lower ability students, implying that it is insufficient to look only at school *average* achievement. Smyth also notes the need to clarify the outcomes under investigation (e.g., academic performance, early school leaving, student self-image), as schools may not be equally effective or ineffective across all outcomes. She suggests that rather than attempting to construct league tables of performance, it would be much more useful to focus on the schooling factors associated with particular dimensions of academic and personal or social development (such as class organisation including streaming; curriculum and subject choice; pupil involvement; parental involvement; disciplinary climate; teacher-pupil interaction; school management; staff development; and school development).

It was noted earlier that Ireland participated in TALIS in 2008. Participants were teachers of all subjects teaching Junior Cycle students. The data offered very limited possibilities for making explicit linkages between teacher data and student performance, so the main focus of TALIS reporting was on teacher and principal responses. Although teachers in Ireland showed stronger endorsement for constructivist beliefs about teaching than for direct transmission beliefs, they were more supportive of direct transmission beliefs

than their counterparts in five other comparison countries (Gilleece, Shiel, Perkins & Proctor, 2009). Teachers in Ireland showed a stronger preference for structuring teaching practices (i.e., practices that aim to ensure that learning is well structured) than teachers in any other TALIS country. In Ireland, student-oriented activities (e.g., group work, differentiated instruction) and enhanced activities (e.g., extended projects or debates) were used relatively infrequently. Irish principals showed stronger use of an administrative leadership style compared with an instructional leadership style. Average classroom disciplinary climate was found to be positive in Ireland and above the corresponding international average.

A multilevel model based on TALIS showed that various school and teacher factors were significantly associated with classroom climate in Ireland (Gilleece et al., 2009). Having controlled for other variables, a more positive classroom climate was associated with lower average class sizes in the school, having fewer students with below average ability in the classroom, and the school not being part of DEIS. Having controlled for other variables, teachers who had full-time contracts, those who had permanent contracts, and those who made greater use of structuring practices reported more positive classroom climates. Furthermore, disciplinary climate was positively associated with teacher-student relations.

The TALIS data offered a useful insight into conditions and practices at lower secondary level a decade ago. More recently, analysis of TIMSS 2015 data has indicated that direct instructional practices (such as explaining new content to the class or working problems as a class with direct guidance from the teacher) are commonly used by teachers of Second year mathematics and science classes, while practices aimed at developing higher-order thinking (such as asking students to decide their own problem-solving procedures, or setting a challenging exercise going beyond direct instruction) are used occasionally (Clerkin, Perkins & Chubb, 2018). As TIMSS data are collected at both classroom- and school-level (i.e., from the mathematics and science teachers of participating students, as well as the school principal) and can be linked directly to student achievement and other student outcomes, further multilevel and multivariate analysis of these data at primary (Fourth class) and post-primary (Second year) levels could shed further light on understanding differences in outcomes between schools and classes.

## CONCLUSIONS

This paper outlined some of the school and classroom characteristics of successful schools that have been identified in the literature. These include: effective leadership; a focus on learning; a positive school culture; high expectations of students and staff; monitoring progress at school, classroom, and student levels; involving parents; generating effective teaching; professional development of staff; and involving students in the educational process. The literature suggests that these are the characteristics associated with effective schools and schools demonstrating these characteristics are most likely to have high academic achievement and other positive outcomes. However, selecting the most appropriate measure of effectiveness (e.g., high levels of achievement, or rates of progress, and in which domains) are not simple issues.

In terms of monitoring school-level achievement and ranking schools on the basis of performance, England and the US have been to the fore in using sophisticated statistical models to rank schools on the basis of their achievement. The precise approaches have varied over time with considerable variation in the extent to which raw achievement results are adjusted to take into account differences in socioeconomic background of schools' intakes. It was noted in this paper that numerous prominent researchers have argued against the use of school league tables in isolation and urged caution in using even adjusted rankings for high-stakes purposes.

This is not to diminish the role of quantitative analysis in supporting a system of accountability whereby adjusted achievement data may be used as a screening tool for schools requiring more detailed follow up. Any such follow up should give careful consideration to the profile of the student population, in particular the socioeconomic profile. It may be the case that changes have taken place in the external conditions of the school which the school cannot readily influence. Consideration should also be given to school and teacher processes that are known to be associated with successful outcomes as, in the longer term, if these processes are in place it can be hoped that they will promote a positive climate and ultimately good levels of achievement. Many such processes are modifiable by the school whereas the socioeconomic profile of students is not easily modifiable. Drawing on Harris et al. (2006), we might expect that effective schools find the best fit between their internal conditions and the external contingency factors they are confronted with.

This paper also presented evidence of low between-school variance on cognitive achievement measures in Ireland. This suggests that in selecting schools, parents can be assured that achievement outcomes in Ireland tend to vary more *within* schools than *between* schools. Of course, achievement outcomes on cognitive tests are just one criterion that parents would likely consider when selecting schools. Other important factors might include, for example, the language of instruction, school ethos, gender composition, friends or siblings in attendance, and proximity to the child's home (GUI, 2013). As noted in the introduction to this paper, relatively little is known in Ireland (and internationally) about between-school variance in non-cognitive measures such as motivation and self-esteem. There is some evidence that between-school variation in non-cognitive outcomes may be lower than for achievement outcomes (Clerkin, 2016; Van Landeghem et al., 2002). However, variation between schools on non-cognitive outcomes tends to be higher for measures related to schools or teachers (such as student-teacher relationships) than for more individualised measures (such as life satisfaction or social self-efficacy) (Clerkin, 2016).

One policy implication is that it may be more fruitful to focus research attention on classroom and teacher processes (rather than at school level) and to prioritise longitudinal studies because international evidence suggests that teacher processes may have greater effects than school processes and longitudinal studies are more likely than cross-sectional studies to accurately identify such effects (e.g., Blazar & Kraft, 2017). Wray and Medwell (1999) highlight some of the characteristics of teachers who could be 'shown to be effective in teaching literacy' (p. 1). These included: a strong command of their subject area (both in terms of *content knowledge* and the *processes* underlying students' learning), a strong belief in explicitly connecting activities to the intended learning goal, the tendency to embed narrow learning activities in a wider context, and the use of techniques aimed at maintaining pupils' focus (working at a brisk pace, setting clear time frames for particular tasks, and reviewing what had been done at the end of the lesson). Gaining a greater understanding of the most appropriate teaching methods and approaches to assessment in the Irish context generally, and specifically in contexts of disadvantage, would help further understanding of how to create the most effective learning environments for all students in Ireland. Ongoing work on DEIS is contributing to this area.

Another policy implication of the low between-school variance in achievement – and consequently the difficulty in identifying statistically

significant predictors of achievement at school level – is that it is necessary in Ireland to give considerable attention to the important role of home processes and learning that happens outside the formal classroom environment. For example, children with access to fewer resources for learning at home (such as fewer books or lower levels of parental educational attainment) are reported by their parents to engage in various forms of early numeracy play (e.g., counting objects or playing with blocks) at a young age less frequently than their peers in homes with more resources for learning (Clerkin & Gilligan, 2018). The Home-School Community Liaison scheme, operated as part of the supports provided to schools participating in the SSP/DEIS scheme, represents one attempt to make positive links between the home and the school. Furthermore, there is some evidence to suggest that high-quality summer learning programmes can be effective in mitigating the effects of 'summer learning loss' (the tendency for student achievement to decline over the summer holidays compared with the end of the previous school year), which has been linked to differences in resources and social and educational practices at home during the summer months (Weir, Kavanagh, Kelleher & Moran, 2017). The magnitude of the decline in achievement after summer holidays has often been found to be greater among students from more disadvantaged backgrounds, and to accumulate over several years as students progress through school, thereby contributing to widening achievement gaps compared to more-advantaged peers over time.

The importance of the home environment to children's intellectual, social, and emotional development should not be underestimated. For example, parental expectations of their child's cognitive development, as well as parents' engagement in literacy- and numeracy-related activities with their child from a young age, are associated with the development of stronger literacy and numeracy skills in early childhood (Huntsinger, Jose & Luo, 2016; Segers, Kleemans & Verhoeven, 2015; Sénéchal & LeFevre, 2002), as well as more positive attitudes to mathematics when older (Clerkin & Gilligan, 2018), and with subsequent academic performance in school (e.g., Mullis, Martin, Foy & Hooper, 2016). Literacy-related activities include activities such as telling stories, reading aloud (e.g., reading from books or reading signs or labels while interacting with the child), or simply talking about what is going on around them. Numeracy-related activities include such actions as playing with blocks or shapes, writing (or reading) numbers, or counting objects.

It should be noted that many of these activities are complementary. For instance, playing with blocks engages children's fine motor skills, develops

their spatial awareness, and provides opportunities for parents to provide mutually-reinforcing discussion of the activity (e.g., providing relevant vocabulary related to concepts like 'above', 'below', 'behind', 'around', and 'beside'). Parental modelling of positive attitudes towards school and education, and modelling practices such as reading at home or use of local libraries, can also play an important role in the development of children's own attitudes and behaviours.

As well as activities (or play) of this nature that might be seen as being explicitly 'educational' to some degree, there are other aspects of the home environment that directly impact on a child's ability and readiness to learn at school. For example, the teachers of almost two-thirds of Fourth class pupils report that their ability to teach their class is limited by pupils coming to class without having had enough sleep, while pupils' lack of basic nutrition is cited as a limiting factor by the teachers of more than one-fifth of pupils (Clerkin & Creaven, 2013; Clerkin et al., 2017).

Another (increasingly salient) issue is the degree and nature of children's use of technology at home. A review of the developmental impact of 'screen' technology such as televisions, tablets, and smartphones in infancy and early childhood (Haughton, Aiken & Cheevers, 2015) noted several potentially deleterious effects associated with their frequent use, about which parents should be aware. Basic features of children's programming such as flashing lights and rapid visual and auditory changes may be overstimulating and inhibit the development of executive functioning (e.g., attentional control). Regular screen time can reduce the duration and quality of creative play, child-caregiver interaction, and exercise, with negative implications for the development of social relationships, vocabulary and language, and physical health, while watching TV (particularly close to bedtime or in the bedroom) can disrupt sleep. Among older children, the presence of a TV in the bedroom (as well as prolonged use – more than two hours per day – of TVs or computers) is associated with shorter sleep duration at night and greater feelings of tiredness (Garmy, Nyberg & Jakobsson, 2012). Recent surveys show that approximately half of primary-school pupils in Ireland report having a TV of their own in their bedroom (Clerkin & Creaven, 2013; Kavanagh et al., 2015) and that such pupils tend to perform more poorly on tests of achievement. For these reasons, among others, Haughton et al. (2015) call for evidence-informed guidelines for parents on their children's use of technology – particularly in the early years when the brain is developing rapidly and children are learning the foundations of language and

social interaction – and greater regulation of programmes and apps that are marketed to parents as being educational.

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