Rialtas na hÉireann
Government of Ireland

Towards a New Literacy, Numeracy and Digital Literacy Strategy

A Review of the Literature

DCU
Ollscoil Chathair Bhaile Átha Cliath
Dublin City University

Prepared by the Institute of Education, Dublin City University for the Department of Education

Authors of the Report

All of the authors contributed equally to this report, which can be cited as follows: Kennedy, E., Shiel, G., French, G., Harbison, L., Leahy, M., Ó Duibhir, P., & Travers, J. (2023). *Towards a new literacy, numeracy and digital literacy strategy: A review of the literature.* Department of Education (Ireland).

Dedication

This project: *Towards a New Literacy, Numeracy and Digital Literacy Strategy: A Review of Literature* is dedicated to our esteemed colleague, the late Sue Miller, DCU Librarian. In Summer 2021, Sue supported over 35 colleagues across the Institute of Education in undertaking the systematic reviews underpinning this project. Her knowledge, skill, patience, graciousness and generosity with her time were instrumental in achieving the completion of this project. May she rest in peace.

Acknowledgements

The study was commissioned by the Department of Education (DE). The authors are grateful to Karen Murtagh, Maeve Price and Evelyn O'Connor (DE) for their support during this review.

Particular thanks are due to Denis Twomey for formatting and presenting this report.

We also acknowledge and appreciate the support and advice of Professor Anne Looney, Executive Dean, DCU Institute of Education and our peer reviewers:

- Professor Mathias Urban, Desmond Chair of Early Childhood Education, DCU IoE
- Professor Michael O'Leary, Prometric Chair of CARPE, DCU IoE
- Professor James Spillane, Spencer T. and Ann W. Olin Professor in Learning and Organizational Change, Northwestern University, US
- Rachel Cunningham, Educational Research Centre.
- Dr. Emer Delaney, Educational Research Centre.

Colleagues at Dublin City University, Institute of Education

We are particularly grateful to all of the colleagues at Dublin City University, Institute of Education, who contributed to the 27 systematic review papers and, in particular, those who coordinated each section and led papers within sections, the summaries of which are reported in Part B of this report.

Systematic Reviews	**Coordinators**	**Teams**
B1: 1.2.3.4.5.6. Literacy/Digital Literacy	Eithne Kennedy	Patrick Burke, **Tara Concannon-Gibney**, Jacqueline de Brún, Enda Donlon, Audrey Doyle, **Bernadette Dwyer**, Sabrina Fitzsimons, **Geraldine French**, Fiona Giblin, **Eithne Kennedy**, Gillian Lake, Margaret Leahy, **Elaine MacDonald,** Aisling Ní Dhiorbháin, Máire Ní Láimhín; Pádraig Ó Duibhir, Sandra O'Neill, Irene White
B2. 1.2.3.4.5. Numeracy/Digital Numeracy	Lorraine Harbison	**Deirdre Butler, Thérèse Dooley**, Fiona Giblin, Thérèse Farrell, Cora Gillic, **Paul Grimes, Lorraine Harbison**, Mary Kingston, Siún Nic Mhuiri, **Sandra O'Neill**, Miriam Ryan
B3.1.2.3 Assessment	Gerry Shiel	Thérèse Dooley, Jennifer Guevara, **Marlene McCormack, Gerry Shiel**
B4. 1.2.3.4.5.6.7.8.9. Diversity and Inclusion	Joe Travers	Geraldine French, **Eithne Kennedy**, **Malgosia Machowska-Kosciak, Sinéad McNally, Elizabeth Mathews**, Christina O'Keeffe, Vasiliki Pitsia, **Jane O'Kelly, Ellen Reynor, Gerry Shiel**, Caoimhe Shiel **Joe Travers**
B5.1.2. Professional Learning/Leadership	Fiona King	Geraldine French, **Fiona Giblin,** Clare Halligan, **Fiona King**, Marlene McCormack, Conall Ó Breacháin, Miriam Ryan
B6.1.2. Family and Community	Geraldine French	Thérèse Farrell, **Geraldine French,** Caoimhe Shiel, Marlene McCormack, **Siún Nic Mhuirí**

Contents

List of Figures

List of Tables

Systematic Reviews Prepared for Part B

B1: Pedagogical Strategies to Support Oral Language, Emergent Literacy, Literacy, Digital Literacy and Disciplinary Literacy Development

B1.1 French, G., & Lake, G. (2022). *Pedagogical strategies to support oral language development and emergent literacy in early childhood education and care*. *A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881320

B1.2 Kennedy, E, Concannon-Gibney, T. & Dwyer, B. (2022). *Pedagogical strategies, approaches and methodologies to support literacy in the primary school: A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881327

B1.3 McDonald, E., Doyle, A., Fitzsimons, S., & White, I. (2022). *Pedagogical strategies to support literacy development at post-primary level. A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881330

B1.4 Concannon-Gibney, T., de Brún, J., Ní Dhiorbháin, A., Ní Láimhín, M., & Ó Duibhir, P. (2022). *Pedagogical strategies, approaches and methodologies to support literacy and digital literacy development for Gaeilge and EAL*. *A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881298

B1.5 Dwyer, B., Leahy, M., Donlon, E., Giblin, F., & O'Neill, S. (2022). *Pedagogical strategies, approaches and methodologies to support digital literacy*. *A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7882183

B1.6 Dwyer, B., Burke, P., Kennedy, E. (2022). *Pedagogical strategies, approaches and methodologies to support disciplinary literacy at primary and post-primary levels*. *A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881295

B2: Pedagogical Strategies to Support Numeracy Development

B2.1a O'Neill, S., Gillic, C., & Kingston, M. (2022). *Pedagogical strategies, approaches and methodologies to support numeracy in early childhood education*. *A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881705

B2.1b Harbison, L., Farrell, T., & Ryan, M. (2022). *Pedagogical strategies, approaches and methodologies to support numeracy in primary education*. *A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881290

B2.1c Grimes, P., Dooley, T., & Nic Mhuiri, S. (2022). *Pedagogical strategies, approaches and methodologies to support numeracy in post-primary education*. *A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881285

B2.2 Butler, D., Giblin, F., Kingston, M. (2022). *Numeracy and digital learning: Use of digital technologies as tools for numeracy development*. *A review*

of the literature. Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881367

B2.3 Dooley, T. & Ryan. M. (2022). *Numeracy integration across primary and post-primary curricula*. *A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881282

B3: Assessment to Support the Development of Literacy, Numeracy and Digital Literacy

B3.1 McCormack, M., & Guevara, J. (2022). *Assessment of literacy and numeracy in early childhood education. A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881275

B3.2 Shiel, G. & Dooley, T. (2022). *Formative assessment to support literacy, numeracy and digital literacy at primary and post-primary levels*. *A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881266

B3.3 Shiel, G. (2022). *Summative assessment of literacy and numeracy. A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7882174

B4: Supporting Literacy, Numeracy and Digital Literacy Development of Diverse Learners

B4.1 French, G. (2022). *Supporting literacy and numeracy in early childhood for those at risk of educational inequality*. *A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881255

B4.2a McNally, S., & O'Keeffe, C. (2022a). *Supporting the literacy development of children with additional needs in early childhood education in Ireland (from birth to 7 years). A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881253

B4.2b McNally, S., & O'Keeffe, C. (2022b). *Supporting the numeracy development of children with additional needs in early childhood education in Ireland (from birth to 7 years)*. *A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881248

B4.3 Kennedy, E. & Shiel, G. (2022). *Addressing achievement gaps between disadvantaged and non-disadvantaged students in primary and post-primary schools: A review of recent international research*. Dublin: Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881164

B4.4 O'Kelly, J. A (2022). *Narrative review of research on Youthreach*. Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881241

B4.5 Shiel, C., & Machowska-Kosciak, M. (2022). *Factors affecting the literacy development of students from the Roma/Travelling Community*. *A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7884013

B4.6 Reynor, E. (2022). *Best-evidence literacy instruction and intervention for students with additional learning needs (8-18 years). A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7882162

B4.7 Travers, J. (2022). *Review of supports for learners with learning difficulties in mathematics, with dyscalculia and developmental disabilities*. *A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881224

B4.9 Mathews, E. (2022). *Strategies to support literacy development for deaf and hard of hearing children. A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881217

B4.10 Shiel, G., & Pitsia, V. (2022). *Addressing the needs of high-achieving and highly able students in literacy and numeracy*. *A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881210

B5: Continuous Professional Learning and/or Development

B5.1 King, F., French, G., & Halligan, C. (2022). *Professional learning and/or development (PL): Principles and practices*. *A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7882155

B5.2 Giblin, F., McCormack, M., Ó'Breacháin, C., & Ryan, M. (2022). *Professional development for leaders and specific contexts and disciplines: Literacy (including Gaeilge and digital literacy) and numeracy. A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7882171

B6: Enabling Family and Community Engagement to Support Literacy, Digital Literacy and Numeracy Development for All Children

B6.1 Nic Mhuirí, S., Farrell, T., French, G, McCormack, M & Shiel., C. (2022). *Enabling family engagement to support literacy, digital literacy and numeracy development for all children*. *A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881197

B6.2 French, G., Farrell, T., McCormack., M., Nic Mhuirí., S. & Shiel., C. (2022). *Enabling community engagement to support literacy, digital literacy and numeracy development for all children. A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881192

Introduction to the Report

The current report is part of a response to a tender issued by the Department of Education in May 2021, which sought a review of the research in relation to literacy (including digital literacy) and numeracy as part of the development of a successor strategy to the National Literacy and Numeracy Strategy (NLNS, 2011-2020) (DES, 2011) and the Interim Review of the Strategy (NLNS, 2017) (DES, 2017).

The 10-year National Literacy and Numeracy Strategy for Children and Young People (NLNS, DES, 2011) was first introduced in 2011 and reviewed and revised in 2017 (DES, 2017), when many of the achievement targets set in 2011 had been achieved. Six key pillars of the NLNS set out policy, implementation actions and timelines for delivery across the continuum of schooling in relation to parental involvement, reform of teacher education, school leadership, inclusion, curriculum reform and accountability. While all six pillars were designed to impact positively on the literacy and numeracy development of *all* children regardless of socio-economic status, a particular emphasis was put on DEIS (see next paragraph) in Pillar 5: Addressing the Needs of Diverse Learners. In addition, guidelines on School Self-Evaluation (DES, 2012, 2016) were issued to all schools to support them in identifying areas for improvement and in developing three-year action plans.

In 2005, the large-scale ambitious initiative, *Delivering Equality of Opportunity in Schools* (DEIS, DES, 2005) targeting *all* schools (urban and rural) designated as disadvantaged was launched. The DEIS strategy built on earlier initiatives and also differed from them in a number of ways. First, schools were asked to create three-year action plans to include: (a) specific literacy and numeracy achievement targets and development plans for how progress toward achieving the targets would be monitored; (b) strategies to improve attendance; and (c) strategies to enhance parental involvement.[1] Second, in line with national research recommendations (DES, 2005b; Eivers et al., 2004), school-based professional development for literacy was provided under the newly formed Professional Development Service for Teachers (PDST) which included guidance on whole school planning for literacy. In addition, training in relation to Reading Recovery (e.g., Clay, 1993) and First Steps (Education Department of Western Australia, 1994) was offered to band one schools in year one and extended further over

[1] Schools are expected to incorporate plans for leadership, wellbeing and continuous professional development into their DEIS Action Plans.

the next few years. A renewed DEIS Plan was published in 2017, alongside a new model for identifying DEIS schools that drew on the Department's primary and post-primary pupil databases and census data as represented in the Pobal HP Deprivation Index for small areas.[2]

Five goals were established to guide policy implementation in relation to DEIS (DES, 2017):

- *Goal 1: To implement a more robust and responsive Assessment Framework for identification of Schools and effective resource allocation.*
- *Goal 2: To improve the learning experience and outcomes of pupils in DEIS schools.*
- *Goal 3: To improve the capacity of school leaders and teachers to engage, plan and deploy resources to their best advantage.*
- *Goal 4: To support and foster best practice in schools through inter-agency collaboration cross-departmental and cross-agency working.*
- *Goal 5: To support the work of schools by providing the research, information, evaluation and feedback to achieve the goals of the Plan.*

The scope of the current tender was very broad, encompassing a review of research across early childhood education and care, primary and post-primary education in each of the domains of literacy, digital literacy and numeracy. Additionally, a review of outcomes achieved in relation to the NLNS (2011-2020) and coherence with other related strategies was a focus.

The report is structured into four main sections. Following a consideration of the role of systematic reviews in educational policy making, the methodology underpinning the reviews of the literature is presented. Thereafter, the report comprises three main sections: Part A, Part B and Part C.

Part A focuses on the national context and is divided into six sub-sections *(A1-A6).* It explores national and international definitions of literacy (including digital literacy) and numeracy *(A1).* It situates the NLNS within a wide range of national policies and strategies *(A2),* NLNS strategy outcomes to date *(A3)* across the continuum of education

[2] The DEIS scheme was subsequently expanded to include 322 additional schools (284 primary and 38 post-primary) from September 2022 (see https://www.gov.ie/en/publication/a3c9e-extension-of-deis-to-further-schools/)

(early childhood education and care [ECEC], primary, post-primary) and curricular developments *(A5).* Drawing on evaluations of the Delivering Equality of Opportunity in Schools Strategy (DEIS, DES, 2005- 2020) conducted by the Educational Research Centre and related reviews by Economic and Social Research Institute, achievements and challenges are reviewed *(A4).* Finally, large-scale international initiatives to improve literacy (including digital literacy) and numeracy are reviewed in relation to purposes, implementation, outcomes, target setting and monitoring of achievement of targets *(A6).*

Part B focuses on the international context and is divided into six sub-sections *(B1-B6).* It presents a summary of the key findings arising from the systematic reviews conducted as part of the tender response. All reviews explored pedagogical strategies, approaches and methodologies to support literacy and numeracy and gave due recognition to the cognitive and affective dimensions of learning, including learner voice and agency.

In relation to literacy (B1), three separate reviews were conducted across early childhood education and care, primary and post-primary. Additional reviews explored research in relation to Gaeilge and the teaching of English as an additional language, which were combined into a single review. Two further reviews explored digital literacy and the critical role of literacy across disciplines.

In relation to numeracy (B2), three separate reviews were conducted across early childhood education and care, primary and post-primary. Two further reviews explored the use of digital technologies as tools for numeracy development and numeracy across the disciplines (curriculum).

Three dimensions of assessment were examined (B3). First, assessment in early childhood settings is explored. Second, the effects of formative assessment tools to support literacy and numeracy (incorporating digital technologies for assessment) at primary and post-primary levels are reviewed. Third, evolving approaches to summative assessment in national contexts are considered.

Supporting literacy and numeracy development of diverse learners across the curriculum (B4) comprised nine reviews of the literature. The first three examined how the literacy and numeracy needs of children in marginalised communities can be addressed in early childhood education and care settings, in school settings (primary and post-primary) and in Youthreach settings. Three further reviews explored the

research on supporting children with Autism, mathematics difficulties, and Dyslexia and general literacy difficulties. Three additional reviews examined the particular needs of children who are deaf or hard of hearing, Roma and Traveller children and high-achieving learners in literacy and numeracy.

Continuous professional development and learning (B5): comprises two reviews which focused on the research underpinning teachers' and leaders' professional learning in relation to literacy (including digital literacy) and numeracy, and on supporting school leaders to implement change in literacy, numeracy and digital literacy.

Engaging parents and communities (B6) presents the findings from two reviews which focused on strategies for supporting parents to engage children in both formal and informal literacy/digital literacy/numeracy activities and on how schools can collaborate with parents, community initiatives and libraries to enhance learner outcomes.

All 27 systematic reviews are published as separate papers and can be found here alongside the extended review of DEIS.

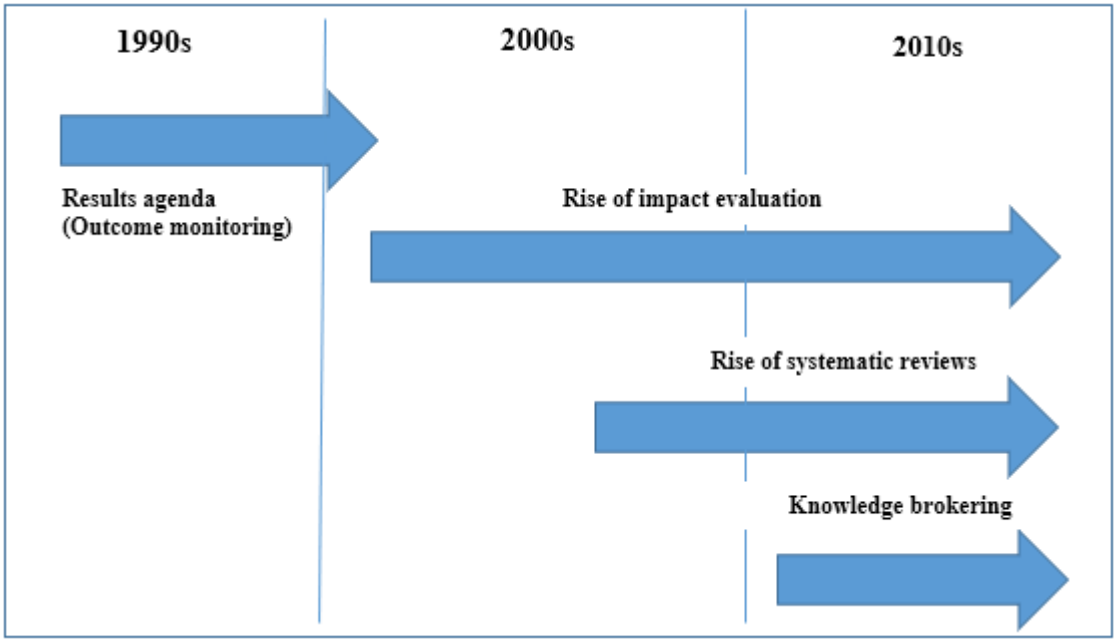
Part C draws together the conclusions and recommendations arising from Parts A and B. Recommendations are presented under each of the six pillars of the National Literacy and Numeracy Strategy.

The Role of Systematic Reviews in Educational Policy-making

The past 30 years have seen exponential growth and proliferation of systematic reviews and meta-analyses of research in many areas of education with a goal of synthesising known research and using it to further inform policy directions. As literacy and numeracy are key processes and skills in developing an individual's potential and success in school and adult life, it is not surprising that governments around the world have sought to bring such evidence bases to bear when considering future policy directions.

White (2019) has termed this phenomenon the 'evidence revolution' which first emerged in the field of medicine and has since permeated many disciplines, particularly those focused on improving outcomes for individuals and whole populations. White argues that the 'evidence revolution' has undergone significant change and development over four overlapping waves (Figure 1) and is evolving into ever more sophisticated forms of 'knowledge brokering', as data are harnessed to inform policy development and funding allocations in key areas such as health, medicine, social work and criminal justice, and more recently in education.

Figure 1: The Four Waves of the Evidence Revolution (White, 2019)



Wave One in the 1990s largely focused on the setting of targets, establishing greater levels of accountability and monitoring of progress towards achieving the targets. It is exemplified in specific educational policies such as the No Child Left Behind (US,

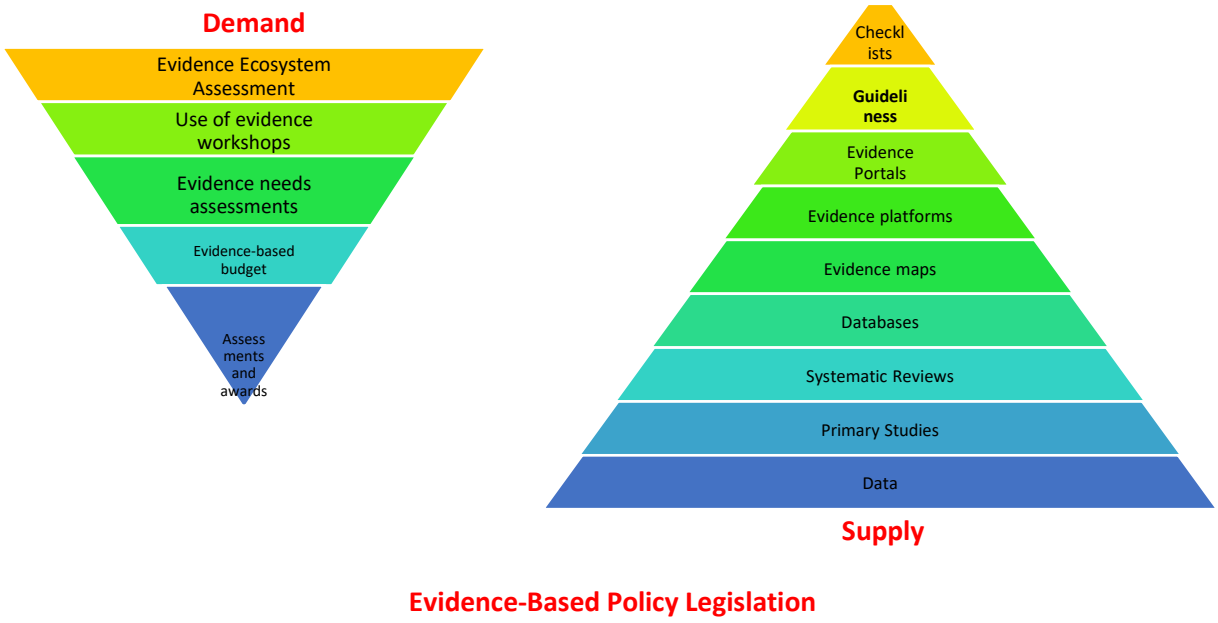
2001) and in broader international policies such as the Sustainable Development Goals (UN, 2015). As highlighted by Fien et al. (2021), simply focusing on 'expected results does not guarantee that agencies, policies and interventions will lead to practices to achieve those results' (p. S107). This gave rise to **Wave Two** in the early 2000s which saw a major increase in the number of impact evaluations arising predominantly from randomised controlled trials. In the US, the Education Reform Act (2002) mandated greater rigour for education research and established the Institute of Education Sciences (IES) to support such research. According to Fien et al. (2021), the IES has since funded over 560 development and innovation projects and 467 Efficacy Grants to test pilot programme impacts, 72 of which are focused solely on literacy. As the body of individual studies grew, it gave rise to **Wave Three**, the growth of systematic reviews and meta-analyses. In systematic reviews, researchers detail the processes and methods used to 'select, evaluate and synthesise all of the available evidence on a given topic' (Fien et al., 2021, p. S107). In meta-analyses, studies can be pooled and in applying a range of statistical analytical tools, the weight of evidence –presented as effect sizes- for a programme or study can be generated.

White (2019) notes that in the early 2000s only a few systematic reviews were published each year in the field of education, but by the end of the decade this had risen to over 20 a year, and by 2018 it was over 200. Such growth gave rise to **Wave Four, '**knowledge brokering or knowledge translation', a consideration of how best to 'institutionalise the use of evidence in policy and practice (White, 2019, p.4). He further conceptualises this evidence revolution for policy legislation as a pyramid (Figure 2) in which *the layers represent higher degrees of knowledge translation and curation* rather than standards of evidence as in a typical pyramid apex. Databases store studies and reviews related to specific sectors and may also be associated with specific research designs (e.g., IES database of RCTs: https://ies.ed.gov/).

The next layer, evidence maps, guides users to the evidence they are seeking in a database, and is usually presented in a structured summary form (e.g., a summary of research activity for a specific question or topic) with current gaps in the evidence base highlighted. As such, it can be used by funders to finance research to fill those gaps. Evidence maps increase discoverability and allow researchers to identify studies for review and those that are strong enough to be developed into guidelines and checklists (Fien et al., 2021). Evidence platforms provide users with a range of evidence-based

products in a user-friendly manner (e.g., links to summaries of the original research with indications of intervention design and weight of evidence). Databases, evidence maps and platforms link the consumer or user back to the original research studies. The final three layers of the pyramid, portals, guidelines and checklists, 'enable evidence informed decision-making *without* requiring the decision-maker to look at the research paper' (White, 2019, p.5). As such, these layers are highly dependent on authors' synthesis and are open to interpretation.

Figure 2: The Evidence Architecture (adapted from White, 2019)



Examples of evidence portals in education are the *What Works Clearing House* (WWC), an initiative of the Institute of Education Sciences (IES) in the US and the *What Works Centres,* such as the Education Endowment Foundation in the UK. These portals house toolkits developed from syntheses of evidence-based studies. The WWC US has developed over 24 practice guides, eight of which address literacy skills for children in school settings. Though checklists designed to increase evidence use, reduce errors and improve outcomes are common and effective in the field of medicine (e.g., guidance provided to the public on stemming the spread of infection from COVID-19), Fien et al. (2021, p. S109) argue that 'education has relatively few examples of how checklists can improve evidence use or outcomes'. In sum, the evidence architecture on the supply side is multi-faceted and wide ranging. How this body of evidence on the supply side is harnessed and institutionalised into policy depends on the demand side of the pyramid, the architecture of which White (2019) argues is much less developed.

The first step in building the demand side architecture of a sector is to engage in an **Evidence Ecosystem Assessment** (EEA) which would map for policy makers, the agencies involved in producing the evidence, brokers of the evidence, who is using it and for what purposes (White, 2019). This would involve reviewing or updating existing evidence and mapping any gaps in the literature (EGMs). Next, White argues that forming a community of practice is necessary and can be facilitated through use of **Evidence Workshops**. Such workshops are a way for policy makers who use the evidence base to make funding decisions and for researchers who produce the evidence, to form a community of practice to consider the next steps through conducting **Evidence Needs Assessments (ENAs).** Here, priorities for further primary studies to address gaps can be identified, so that the lower levels of the demand side of the pyramid (**Evidence-Based Budgets (EBB) and Evidence-Based Awards (EBAs**) can be serviced. Such steps are intended to reduce overlap, duplication and ensure public funding is targeted towards interventions which have strong research support.

The demand side of the pyramid's architecture continues to grow at government level, particularly in the US and UK. In 2017, the *Foundations for Evidence-Based Policymaking Act* was enacted in the US which requires government departments and agencies to develop policy-relevant questions to support policy-making. Similarly, in the UK, through the Cabinet Office, government departments were asked to develop Areas of Research Interest to support policy-making (White, 2019). Incentivising governments to draw on evidence when allocating funding is also on the increase and is being closely monitored. For example, the Invest in What Works Index in the US (based on a transparent scoring structure developed through a consultative process) publishes an annual assessment of the use of evidence in funding awards. Similarly, in the UK, the Sense of Science (2018) publishes an appraisal of evidence use in government policy proposals.

In Ireland, the commissioning of research literature reviews to inform policy development (such as the current report) is common (NCCA commissioned reviews for curriculum development: e.g., Ó Duibhir & Cummins, 2012; Shiel et al., 2012; Kennedy et al., 2012). Additionally, a consultative approach is generally taken to policy development, unlike in the US and UK where policy is more prescriptive and focused on accountability and testing. In the US and UK, such policies have made slow progress toward closing achievement gaps. In this context, it is worth noting that Ireland

outperforms the UK and US in international studies of literacy. For example, in the Progress in Reading Literacy Study (PIRLS, 2016) the US was ranked 15th and the UK joint 8th. Ireland ranked 4th among participating countries with only two countries achieving a mean score that was significantly higher than Ireland's (Russian Federation, Singapore) (Mullis et al., 2017). Recently, Wyse & Bradbury (2022) in a review of research on early reading and policies in a range of countries concluded that the UK National Curriculum (2014) was an outlier, with its emphasis on phonics - and synthetic phonics in particular - compared to other English-speaking countries where a more balanced approach to literacy is adopted. They concluded that *'in relation to the national curricula of the regions that we reviewed, there is little evidence to suggest that a synthetic phonics first- and- foremost orientation to national curricula is likely to be the most effective orientation' (p.43).* They further argued that analyses of PISA data suggested that the teaching of reading in England has been less successful since the introduction of the prescribed approach to early reading.

Limitations of Systematic Reviews and Evidence Syntheses

Whilst drawing on available research evidence is important when making policy decisions, it should be borne in mind that there are many limitations to systematic reviews and meta-analyses. By definition, the kinds of studies which can be included in such reviews are of an experimental (RCT) or quasi-experimental nature. Such research designs test hypotheses and try to control for differences across sites and participants, and, as such, they may be quite narrow in focus, limited to the particular populations and conditions where the research was conducted and so findings may not transfer across different sites and locations. It is important to recognise that research is conducted with particular children, particular teachers and particular schools in particular countries and such contextual factors must be considered when contemplating evidence for decision-making. Myhill et al. (2012) also highlight important limitations to RCT:

> 'RCT may be too focused on causal relationships between an intervention and student outcomes, paying insufficient attention to other factors. In seeking to generalise, it always has the potential to miss the particular. The emphasis on principles such as intervention fidelity, blind randomisation and bias can serve to exclude the very variables which are most significant should the intervention be generalised into professional practice (p.162)

Secondly, research suggests that though systematic reviews can guide and meta-analyses can determine weight of evidence for elements of interventions, the impact of

interventions depends on local context (Dietrichson et al., 2017). In a meta-analysis of a large sample of studies investigating interventions for literacy and numeracy in disadvantaged settings, Dietrichson et al. (2017, p. 273) stress that 'even in this large sample of studies, it was not possible to fully explain why some interventions worked better than others'. They further highlight that there is considerable variation in the duration of studies, some of which are relatively short and most of which do not have sufficient follow-up data post-intervention to determine if there are lasting effects of impact. Provision of evidence of the cost-effectiveness of interventions is also lacking.

Thirdly, many of the systematic reviews and meta-analyses reviewed in this report revealed substantial variation in effect sizes, within and between components which could not be fully explained by study characteristics. This again underscores the importance of local context and the complex inter-relatedness of many factors which shape interventions including learners' need, teachers' attitudes, beliefs, experience and pedagogical subject knowledge. Myhill et al. (2012) argue convincingly that:

> policy development needs to take these interacting factors into account and, in particular, consider how to develop professional pedagogical ownership of policy in ways which foster principled adaptation to meet learners' needs and interests. (p.162)

A similar picture has emerged in Ireland in the context of the DEIS evaluations which though they have provided valuable insights and a picture of trends and patterns in achievement over time, they cannot account for the wide variation in outcomes across DEIS urban schools and this has led to calls by the ESRI for case-study research that 'could provide insights into which school and teacher factors influence such variation' (Smyth et al., 2015, p. ix).

In sum, while there is much we can learn from systematic reviews and meta-analyses, limitations must also be borne in mind when using such evidence in decision-making.

Methodology Underpinning the Systematic Review Process

In reviewing the extant literature in relation to Literacy, Numeracy and Digital Literacy (LNDL) the focus in the first instance was on systematic reviews published since 2011. In general, systematic reviews confer added value and confidence in that they are methodical, transparent and replicable. Systematic reviews may include meta-analyses,

which are a form of review where statistical techniques are used to synthesise the data from several quantitative studies.

Steps in the Review Process

Each of the systematics reviews followed the six steps outlined in Table 1 in developing their reports. An overview of the process is presented here and described in more detail below.

Table 1: Steps in the Review Process

Step 1: Define research question and sub-questions
Step 2: Search the literature using relevant search terms
Step 3: Screen the search results
Step 4: Tabulate findings, and report on effect sizes (where available)
Step 5: Synthesise and interpret the evidence
Step 6: Present results in a concise narrative report with relevant recommendations linked to pillars of the NLNS

Step 1: Define research question or sub-question

Each team began by developing research questions to guide the search and review process to identify systematic reviews in literacy, numeracy and digital literacy in general, and subdomains such as English, Gaeilge, ISL, DEIS, diversity of languages, English as an additional language (EAL) and other types of learners from early childhood to post-primary school including those with special education needs. Where a systematic review or no meta-analysis was available on a topic, a more traditional literature review was adopted using a systematic search strategy against clear inclusion and exclusion criteria. The synthesis of findings in these cases were presented in narrative reviews. Where relevant and necessary ‘hand’ searches focusing on international handbooks, journal articles, national and international reports (e.g., DE, NCCA, NCSE, EU, OECD) were utilised. Research questions for each review can be found in the appendix in the review.

Step 2: Search the literature

All potential studies relevant to the research questions were identified through a structured search of the print and digital academic literature using the extensive resources of DCU Library with a particular focus on databases such as SCOPUS, EBSCO, ERIC, Linguistics and Language Behavior Abstracts and MathEduc. Search strings for each database were generated and a sample of these can be found in the appendix of each systematic review.

A Google Scholar search was performed to identify open access and grey literature not made available through DCU Library IReL resources. Examples of 'grey literature' included reports on literacy and numeracy written by organisations such as the Department of Education Inspectorates in the Republic of Ireland and Northern Ireland, UNESCO and OECD. We drew on sources such as the International Database of Education Systematic Reviews (IDESR) which brings together information about published systematic reviews in education in one location.

Web based storage, screening and data extraction tools provided by the library were used to manage the selected literature, including:

Zotero: studies identified for possible inclusion were added to Zotero, a web-based reference manager. From there they were imported into Covidence

Covidence: is a workflow tool used extensively in systematic literature reviews to automate and streamline the process of sifting, selecting or excluding articles.

Step 3: Screen the search results

Within Covidence, study titles and abstracts of the systematic reviews and meta-analyses selected were screened independently by two colleagues for eligibility and inclusion and appropriate exclusion criteria were applied. Any conflicts in selection of studies were resolved by a more in-depth review of the paper and consensus was reached through discussion between colleagues. This process is captured in the PRISMA chart which accompanies each research review.

Step 4: Tabulate and report effect size (in quantitative studies where available)

Studies selected for full review were extracted for further analysis. The full review critically examined study designs and methodologies employed, the number of participants, the quality of intervention where relevant, and the strength of the evidence upon which findings and conclusions were drawn. Each team summarised studies and

utilised a common template which highlighted the study title, authors and year of publication, number of studies included in the review, effect sizes where relevant, main focus of the review, age and grade levels of participants and key findings. The tabulation of studies can be found in the appendices accompanying each review.

Step 5: Synthesise and interpret the evidence

Having gathered the evidence from systematic reviews, meta-analyses and hand searches for areas in which no systematic reviews or meta-analyses existed, findings were synthesised, critically evaluated and themes developed.

Step 6: Present the results in a concise narrative report and make relevant recommendations

Results of the reviews of the literature according to the topics investigated were presented in a narrative report. In addition, a short summary of each paper was developed and recommendations formed. A key requirement of the tender was that recommendations be linked to the supporting evidence and presented under the relevant pillar of the NLNS. The summaries of the reviews are presented in Part B of this report. All recommendations are presented in Part C.

Part A: Literacy and Numeracy in the National Context

This section of the report focuses on the national context and is divided into six sub- sections *(A1-A6).* First, it explores national and international definitions of literacy (including digital literacy) and numeracy. Second, the place of the NLNS is considered within a wide range of national policies and strategies. Next, achievement of NLNS strategy outcomes to date and curricular developments across the continuum of education (early childhood education and care, primary, post-primary) are reviewed. Thereafter, drawing on evaluations of the Delivering Equality of Opportunity in Schools Strategy (DEIS, DES, 2005-2020) conducted by the Educational Research Centre and related reviews by Economic and Social Research Institute, achievements and challenges to date are considered. Finally, large-scale international initiatives to improve literacy (including digital literacy) and numeracy are reviewed in relation to purposes, implementation, outcomes, target setting and monitoring of achievement of targets.

A1. National and International Definitions of Literacy, Numeracy and Digital Literacy

A1.1 Definitions of Literacy

In the original NLNS Strategy document (DES, 2011), literacy is conceptualised to include the "capacity to read, understand and critically appreciate various forms of communication including spoken language, printed text, broadcast media, and digital media" (p.8). The strategy document regards literacy as fundamental to a more just and equitable society.

The Strategy document also recognises the importance of fostering literacy skills in a consistent way from early childhood through to adulthood. It notes that the *"knowledge, skills, attitudes and dispositions developed in early years impact significantly upon [children's] later learning experiences"* (p.10). As such, early literacy experiences need to be developed within a broad, balanced, and enjoyable curricular experience and one which is consolidated and developed further throughout the primary school and in junior and senior cycles in post-primary schools.

Literacy needs to be more broadly conceptualised than in the 2011 document to recognise the evolving nature of literacy and what being literate in the 21st century entails (OECD, 2021). Being 'literate' represents the difference between inclusion in and exclusion from society and empowers the individual to fully participate in the social,

political, economic, scientific, health, and cultural activities within that society (Leu et al., 2018). The definition of literacy in the *Aistear* framework (NCCA, 2009, p.56) is broad and inclusive and highlights that literacy is:

> 'more than having the ability to read and write. It is about helping children to communicate with others and to make sense of the world. It includes oral and written language and other sign systems such as mathematics, art, sound, pictures, Braille, sign language and music. Literacy also acknowledges the nature of information communication technology, and many other forms of representation relevant to children including screen based (electronic games, computers, the internet, television).

Such a definition is inclusive and specifically acknowledges the sign systems used by children with a sensory impairment such as those with vision difficulties and students who are deaf and hard of hearing. The definition of literacy should also encompass the cognitive, linguistic, affective, socio-cultural, cultural historical, creative, and aesthetic dimensions of literacy (Kennedy et al., 2012).

The section which follows considers the definitions of literacy provided in NAERM, PIRLS and PISA reports and considers how the definition offered in the 2011 document might be updated to reflect current thinking in three key dimensions: the importance of reading engagement for reading success, reading strategies and task management processes, and digital literacy.

Reading in the National Assessments (NAERM) (Shiel, Kavanagh, & Millar, 2014, p.14) is defined as:

> the process of constructing meaning through the dynamic interaction among the reader's existing knowledge, the information suggested by the written language, and the context of the reading situation. Young readers read to learn, to participate in communities of readers, and for enjoyment.

PIRLS (Mullis & Martin, 2015, p.12) defines reading literacy as:

> the ability to understand and use those written language forms required by society and/or valued by the individual. Readers can construct meaning from texts in a variety of forms. They read to learn, to participate in communities of readers in school and everyday life and for enjoyment.

The PISA definition of reading literacy (OECD, 2019, p.28) notes that:

> Reading literacy is understanding, using, evaluating, reflecting on and engaging with texts in order to achieve one's goals, to develop one's knowledge and potential and to participate in society.

The NAERM, PIRLS and PISA definitions place a value on the importance of engagement for reading success. Engagement places a value on reading for a variety of purposes, including reading for pleasure and the importance of engagement and motivation for learning (Guthrie et al., 2013; Wigfield et al., 2016).

The PIRLS and NAERM definitions note that readers construct meaning from text through social interactions, in communities of readers, where they can enjoy, appreciate and share what they read. The PISA definition notes that readers need to be proficient and skilled and knowledgeable about the reading process. Further, readers need to value the social dimensions of reading, placing a premium on reading for a variety of purposes. The reading literacy framework for PISA 2018 incorporates navigation of both print and digital text formats.

In the NAERM and PIRLS definitions, readers construct meaning from texts (both literary and informational) through a dynamic interchange between the reader, the text and the context. PISA 2018 defines these reading strategies as understanding, using, evaluating, reflecting on and engaging with texts. All of these strategies are necessary but evaluating and reflecting are worthy of further consideration. Evaluating has been added for the first time in PISA 2018 reflecting the importance of critical thinking and evaluation to assessing the veracity, trustworthiness and credibility of the information provided in texts, the author stance, and the relevance of the text for the reader's goals. Reflecting on texts implies that the reader is actively considering the text content by drawing on and applying previous knowledge to make sense of the text. Both evaluating and reflecting suggest task management processes and metacognitive and executive function skills including dispositions for learning, self-regulation, curiosity, setting goals, and monitoring progress. These higher-level processes, strategies and executive function skills might be considered in the new NLNS strategy and a revised definition of literacy.

Writing is a complex problem-solving process (McCutchen, Teske, & Bankston, 2008) and depends, at least in part, on the writer's understanding of and experience with the writing process and with the various skills involved in composing a text. Like reading, the capacity to write well is fundamental to success in school and supports future learning of more complex knowledge, which in turn supports individuals in discovering and reaching their potential in life (Graham, 2019; Kennedy & Shiel, 2019; Kennedy et al., 2022). In line with UNESCO (2021), Camacho, Alves & Boscolo (2021, p.214)

consider writing to be *'a key skill in the twenty-first century and a gateway to lifelong learning, employment, and social inclusion'*. Writing also provides the means for 'personal reflection, thought, creativity, creation of meaning and exchange of ideas, as well as a complement to other modes of communication in a world of multimodal texts' (Patino, Calixto, Chiappe, & Almenarez, 2020, p. 494). While Ireland does not currently have national assessment data pertaining to students' writing quality (unlike, for example, the US, UK, and Australia) it should receive greater attention in considering a broader emphasis on literacy assessment beyond standardised tests of reading. A writing assessment is included as part of a screening and diagnostic battery of assessments in the Post-Primary Assessment and Diagnosis-English (PPAD-E, ERC, 2019), which is used to identify students with literacy difficulties. A revised definition of literacy might include reference to the ability to produce and create text in print, digital and multimodal forms across a range of genres and disciplines, which would further complement the attention afforded to reading while also reinforcing the importance of linkage across the forms of language.

Oracy has been defined as 'our ability to communicate effectively using spoken language. It is the ability to speak eloquently, articulate ideas and thoughts, influence through talking, listen to others and have the confidence to express your views (APPG, 2021, p.2). Dobinson & Dockrell (2021) highlight the links between expressive language skills and academic achievement (Roulstone et al., 2011; Spencer et al., 2017), the supportive role these skills play in literacy development in general (Snow, 2016) and in supporting learning across the curriculum (Alexander, 2013; Shiel et al., 2012). Furthermore, quality of oral language has been found to impact on social, emotional, and mental health, both at school (Benner et al., 2002; APPG, 2021) and in later life (Schoon et al., 2010) as it opens access to further education and employment and is key to engaged and agentic citizenship (APPG, 2021; Allington & McGill Franzen, 2021). Broadening the definition of literacy to include oracy would signal a value and importance on this key literacy skill and would further highlight the reciprocity between the forms of language which, when integrated, support children's engagement, literacy development, and achievement.

A1.2 Definitions of Numeracy

One of the key challenges in reviewing research on numeracy is that, unlike domains such as reading literacy, there is a relative lack of agreement across countries

and studies on the meaning of numeracy. In the original NLNS Strategy document (DES, 2011), numeracy is defined as encompassing:

> the ability to use mathematical understanding and skills to solve problems and meet the demands of day-to-day living in complex social settings. To have this ability, a young person needs to be able to think and communicate quantitatively, to make sense of data, to have a spatial awareness, to understand patterns and sequences, and to recognise situations where mathematical reasoning can be applied to solve problems. (p. 8).

Hence, the definition sets out quantitative reasoning (thinking), communication, understanding data, developing spatial awareness and understanding pattern as key aspects of numeracy. Elsewhere in the NLNS Strategy document, further insights into the nature of numeracy, as understood at the time, are provided:

Young children's (0 – 6 years) development of awareness of materials, shape, space, pattern and difference, classifying, matching, comparing and ordering all contribute to the development of numeracy (p. 10)

Knowledge, skills, attitudes and dispositions developed in the early years impact significantly on later learning experiences (p. 10)

Teachers of all post-primary subjects have an important role to play in developing and consolidating students' ability to use literacy and numeracy (p. 11)

These statements suggest that mathematics and numeracy are broadly similar in the early years and then diverge, with numeracy more strongly related to application of mathematical knowledge and reasoning in a range of contexts after the early years. However, the improvement targets outlined in the current NLNS Strategy are often based on standardised tests and examinations in mathematics – for example, targets for reducing the proportion of lower-achieving students at primary level, and for increasing the proportions taking Higher-level papers in mathematics in public examinations. An exception to this is the use of PISA (the OECD's Programme for International Student Assessment) as a basis for setting targets at post-primary level. PISA describes itself as assessing 'mathematical literacy' – a term often used instead of numeracy, especially in the United States (Jablonka, 2015; Kilpatrick, 2021). However, mathematical literacy is now assessed on computer only in PISA, reflecting a greater use of technology in real life and in workplaces, and suggesting that, in the future, numeracy may come to be defined with reference to technology (e.g., Hoyles et al., 2010). The definition of mathematical literacy adopted by the OECD for PISA 2022 is:

> …an individual's capacity to reason mathematically and to formulate, employ, and interpret mathematics to solve problems in a variety of real-world contexts. It includes concepts, procedures, facts and tools to describe, explain and predict phenomena. It assists individuals to know the role that mathematics plays in the world and to make the well-founded judgments and decisions needed by constructive, engaged and reflective 21st century citizens. (OECD, 2018, p. 7)

This definition highlights the role of real-world problems in PISA - a key aspect of numeracy - as well as mathematical reasoning, communication (describe, explain, predict), and reflection. A related definition, from the OECD PIAAC (Programme for the International Assessment of adult Competencies) defines numeracy as:

> the ability to access, use, interpret and communicate mathematical information and ideas, in order to engage in and manage demands of a range of situations in adult life. (OECD, 2012, p. 34)

Overall, the Strategy implies that, while numeracy can be developed in mathematics classes, and progress in numeracy can be assessed using curriculum-based tests of mathematics (presumably such tests function as proxies for numeracy), numeracy is relevant to all subject areas and to real life. Moreover, like PISA, it encompasses quantitative reasoning and problem solving. For example, whereas assessment items in standardised tests such as the Standardised Irish Graded Mathematics Attainment Tests (SIGMA-T) align with mathematical content domains, these items are further classified and categorised with relation to the assessment of process areas namely "understanding concepts and recalling facts, performing computations and procedures, and solving word problems" (Wall & Burke, 2019, p. 43). This serves to highlight how conceptualisations of both numeracy and mathematics are often intrinsically linked (Tout, 2020). However, Dunphy et al. (2014) interpret the Strategy definition as implying that numeracy is a subset of mathematics. They also note that similar definitions in other jurisdictions may include reference to numerical, statistical and algebraic skills, as well as spatial, patterning and sequencing skills.

As part of Trends in International Mathematics and Science Study (TIMSS), a less challenging version of the assessment was administered in some countries in 2015, referred to as TIMSS Numeracy. This assessment covered the content areas of Whole Number, Fractions and Decimals, Shapes and Measures, and the cognitive domains of Knowing, Applying, and Reasoning.

> TIMSS Numeracy asks students to answer questions and work problems similar to TIMSS Mathematics—Fourth Grade, except with easier numbers and more straightforward procedures. TIMSS Numeracy includes many of the same domains and topics as TIMSS Mathematics—Fourth Grade, but it is designed to assess mathematics at the end of the primary school cycle (4th, 5th, or 6th grades) for countries where most children are still developing fundamental mathematics skills (Grønmo et al., 2015, p. 17).

In 2019, the terminology of TIMSS Numeracy was dropped but it was still administered as a less challenging assessment.

In Ireland, the concept of numeracy is also found in the Junior Cycle framework (DES, 2014), where it is identified as one of eight key skills underpinning Junior Cycle (others include literacy, and managing information and thinking). These key skills feed into the statements of learning for curriculum subjects and short courses. More recently, a draft Primary Curriculum Framework (NCCA, 2020) has specified seven key competencies underpinning primary education, including being mathematical, communicating and using language, and being a digital learner. Being mathematical is described as involving 'children drawing on a range of knowledge, skills, concepts, attitudes, values and dispositions as they recognise, interpret and apply real-world information presented mathematically' (p. 8). Since this aligns quite closely with the Strategy definition of numeracy, it is unclear why the same term is not used.

Recent international reviews of numeracy (e.g., Geiger, Goos & Forgasz, 2015) cite dimensions that might be considered going forward, including critical mathematical numeracy, confidence in mathematics, and interdisciplinary enquiry. Geiger et al. also point to the wide range of terms used instead of numeracy, including mathematical literacy, quantitative literacy, statistical literacy and financial literacy. This clearly presents a challenge in the research context, as different authors may understand numeracy in different ways, and hence the contexts to which their findings apply may vary greatly across studies.

As with research on teaching and acquiring numeracy, research on the assessment of numeracy requires an understanding of the contexts in which assessment occurs and the purpose of assessment. As noted above, the Strategy draws heavily on performance on standardised tests and international assessments, and participation rates in public examinations to generate evidence on numeracy standards. The current study considers the suitability of these approaches to gathering data on numeracy in the context of similar international efforts, as well as relevant outcomes (for example, performance on

PISA mathematical literacy in Ireland has been broadly similar across most cycles since 2000, with the exception of 2009, though the way in which mathematical literacy is assessed in PISA continues to evolve). The report also considers alternative approaches to assessing numeracy across subject areas that are compatible with outcomes-based curricula in various subject areas, and the broader understanding of numeracy implicit in policy documents. These include learning stories (in the early years) and learning progressions that feature key elements of numeracy (quantitative reasoning, problem solving in diverse contexts, self-regulation) (Lysaght et al. 2019). Consideration is also given to approaches to assessing numeracy electronically, given the direction in which PISA has moved since 2015.

A need to clarify understanding of numeracy and to re-consider approaches to teaching and assessing numeracy is reinforced by the increased emphasis it receives in the Interim Review of the Numeracy and Literacy Strategy, where it is stated that 'Our key priority is to engage all education stakeholders with numeracy for learning and life' (DES, 2017, p. 8).

A1.3 Definitions of Digital Literacy

The Interim Review of the Literacy and Numeracy Strategy report (DES, 2017) noted the importance of developing digital literacy skills for all learners as a key priority. In the PIRLS and PISA definitions the terms "written language", "written language forms" and "texts" are used to denote both print and digital texts. This implies that reading in print and reading in a digital format are isomorphic. Although reading in a digital format builds on traditional foundational skills in print-based environments, research suggests that literacy is more complex when you move from print to screen (Afflerbach & Cho 2009; Cho, Woodward & Li, 2018; Coiro & Dobler, 2007; Kuiper & Volman, 2008). For example, the interactions between the reader and the text are more fluid, opportunistic and dynamic. In a malleable reading environment, the reader needs to be more effortful and purposeful and reader choice and control are heightened (Dwyer, in press). Further, given the prevalence of the Internet in everyday life and in work, readers require complex processing strategies to navigate, locate, analyse, evaluate, integrate, synthesise and communicate information presented in multiple modes (including text, image, video, audio), on multiple devices and platforms, and across multiple, and often conflicting, information sources. Such complexities are acknowledged in the most recent PIRLS framework (OECD, 2021) which also highlights that digital readers must create

their own paths through a non-linear environment and apply comprehension strategies to a greater volume of information presented in a more complicated fashion. Dispositions for reading are also important to consider in a digital or online environment. Studies (e.g., Leu et al., 2018; Putman, 2014) point to issues relating to self-regulation, curiosity, resilience, self-efficacy, persistence, intrinsic motivation and an ability to set learner-centred goals.

As discussed in the systematic review on Digital Literacy (Dwyer et al., 2022), digital literacy involves more than the functional use of digital devices and is the "ability to creatively engage in particular *social practices* to assume appropriate *social identities* and to form and maintain *social relationships"* (italics in original) (Jones & Hafner, 2012, p.12 cited in Pangrazio et al., 2020). Becoming digitally literate is a life-long process, spanning periods from early childhood through to adulthood, and involves our students in constantly evolving socially situated practices supported by skills, strategies, stances, and dispositions that enable knowledge development and learning, and the generation, representation and understanding of ideas using digital tools not just as consumers, but also as creators and producers.

The new NLNS strategy document might consider ways to strengthen students' capacity to deal with the complexity of digital reading tasks, when reading across multiple sources and in multiple disciplines, through explicit strategy instruction of these skills, strategies, dispositions and social practices in schools (OECD, 2021).

A2. Situating the NLNS in the Broader Policy Context

A range of education policies and strategies have been published in Ireland in the past decade or so, and while it is important that the education system benefits overall from these policies and strategies, it is equally important that they work together to achieve the national vision for education and that appropriate linkages are made across different but interlinking policy areas.

Systemic alignment or coherence across national policies and strategies is widely considered crucial for policy effectiveness and effective change. At its simplest, coherence implies that various policies sit together because they share a set of ideas or objectives (May, Sapotichne & Workman, 2006). It refers to the design and implementation of policies that are 'mutually reinforcing within and across government departments and agencies' and that 'create synergy' as they work towards agreed

objectives (Mallows, 2015). A lack of policy coherence leads to fragmentation and the perception of policies as a set of separate elements. Scholars also argue that policy coherence is more than this and argue for thinking about coherence as an ongoing, dynamic process rather than a static state (Honig and Hatch, 2004) –a process that schools engage in as they bridge and buffer various demands in their environment. In this sense, coherence is not just about aligning the messages offered by policy texts but also about thinking about how these policy texts might be designed to support schools in their ongoing efforts to construct coherence (Spillane, 2022).

Rather than be presented as yet another policy, it is essential that the forthcoming NLNS not only aligns with other policies and strategies relevant to literacy, digital literacy and numeracy but that it should be the glue that binds them together. In this way, it will assist all stakeholders in understanding how to make appropriate linkages across different but dependent policy areas and also to begin to think how policy can inform school and classroom practice in meaningful ways. This section accordingly documents the existing policy landscape situating the NLNS in the context of related national policies and strategies. It begins by examining a range of policy documents and strategies published by the Department of Education and then moving beyond this department into the wider government arena.

Over the lifespan of the NLNS (2011), there has been increasing emphasis on achieving coherence across educational policies and plans published by the Department of Education. The Department of Education's 'Statement of Strategy 2019-2021', explicitly states that:

> A number of key national education strategies underpin our work and drive the significant changes that are being planned and implemented across the continuum of education. Our whole-of-system approach enables us to integrate these strategies and monitor their progress as they each contribute towards our vision for education. (p.24)

The NLNS (DES, 2011) is listed as the key education strategy in the 'Statement of Strategy 2019-2021' in which the Department also affirms its commitment to the implementation of the NLNS in cooperation with the Department of Further and Higher Education, Research, Innovation and Science.

Other key education policies and strategies published by the Department of Education include:

- *Department of Education (2021). DEIS Plan 2017*[3]
- *Department of Education (2019). The National Síolta Aistear Initiative*[4]
- *Department of Education (2020). Polasaí don Oideachas Gaeltachta (2017-2022)*[5]
- *Department of Education (2013). 20-Year Strategy for the Irish Language – Implementation Plan*[6]
- *Department of Education (2022). Digital Strategy for Schools to 2027*[7]
- *Department of Education and Skills (2010). Síolta, the National Quality Framework for Early Childhood Education.*
- *Department of Education. (2017). STEM Education Policy Statement 2017-2026*[8]

The prominence accorded to the NLNS (DES, 2011) varies across these policies and strategies ranging from strong and explicit linkage in those such as the '*DEIS Plan 2017',* which sets out specific targets for literacy and numeracy (see Section A4) to weak or no linkage in others such as the *STEM Education Policy Statement 2017-2026*.

The *20-year Strategy for the Irish Language* emphasises an integrated approach to the Irish language. Articulated as a set of aims, specific linkage is made to the NLNS (DES, 2011) in relation to the 'Curriculum for teaching of Irish'. At primary level, this refers to the provision of learning outcomes and the inclusion of content that meets the needs of learners in both English medium and Irish medium schools. At post-primary level, aims are set out in relation to the Junior and Senior Cycle syllabi. This stands in contrast to the *Policy on Gaeltacht Education* in which reference to literacy, digital literacy or numeracy is not included.

Although the NLNS (DES, 2011) is referenced in the *STEM Education Policy Statement 2017-2026* (DES, 2017), it is as a strategy document which promotes STEM learning as a key education priority and there is no further linkage between the two policy documents. In identifying the promotion of STEM learning within our education system as a key priority, the STEM Education Policy Statement 2017-2026 stresses that

[3] https://www.gov.ie/en/publication/0fea7-deis-plan-2017/
[4] https://www.gov.ie/en/policy-information/c09af4-national-siolta-aistear-initiative/
[5] https://www.gov.ie/ga/eolas-polasaithe/polasai-don-oideachas-gaeltachta-20172022/
[6] https://www.gov.ie/en/publication/f67134-20-year-strategy-for-the-irish-language-2010-2030/
[7] https://www.gov.ie/en/publication/69fb88-digital-strategy-for-schools/#digital-strategy-for-schools-to-2027
[8] https://www.gov.ie/en/policy-information/4d40d5-stem-education-policy/

STEM education not only involves the teaching of the STEM disciplines and subjects (Science, Technology, Engineering & Mathematics) in isolation but also involves a cross-disciplinary approach and that mathematics underpins all STEM learning activities. A definition of mathematics as understood in the context of STEM learning is offered: "Mathematics equips us with the skills needed to interpret and analyse information, simplify and solve problems, assess risk, make informed decisions and further understand the world around us through modelling both abstract and concrete problems" (p. 6); and the use of digital technologies as part of STEM learning activities is also documented.

Finally, other strategies such as the recently published 'Digital Strategy for Schools to 2027' stress the importance of having "clear and unambiguous" understandings of terms and concepts such as digital skills and digital competence across policy documents that there is a "consistent understanding and development" of what is meant by these terms across the school system (p.37). It states,

> The Department will make sure to complement and reinforce the objectives of the Digital Strategy in other current and future policies and …. forthcoming Numeracy, Literacy and Digital Literacy Strategy. Under this Strategy schools will be supported in their understanding and implementation of these various strategies and policies and how digital technologies can be applied effectively to assist schools in this context. (p55)

A number of relevant policies and plans have been published across other government departments, including:

- *Department of Social Protection (2020). Roadmap for Social Inclusion 2020 – 2025 'Ambitions, Goals and commitments*[9]
- *Department of Children, Equality, Disability, Integration and Youth (2017). The National Traveller and Roma Inclusion Strategy 2017 – 2021*[10]
- *Department of Children, Equality, Disability, Integration and Youth (2019). The Migrant Integration Strategy 2017 – 2020*[11]
- *Department of Children, Equality, Disability, Integration and Youth (2020). The National Disability Inclusion Strategy 2017 – 202*[12]

[9] https://www.gov.ie/en/press-release/0b2e3d-minister-doherty-publishes-roadmap-for-social-inclusion-2020-2025/
[10] https://www.gov.ie/en/publication/c83a7d-national-traveller-and-roma-inclusion-strategy-2017-2021/
[11] https://www.gov.ie/en/publication/5a86da-the-migrant-integration-strategy-2017-2020/
[12] https://www.gov.ie/en/publication/8072c0-national-disability-inclusion-strategy-2017-2021/

- *Department of Children, Equality, Disability, Integration and Youth (2022). Nurturing Skills: The Workforce Plan for Early Learning and Care and School Age Childcare, 2022 – 2022*[13]
- *Department of Children and Youth Affairs (DCYFA). (2014). Better Outcomes, Brighter Futures*[14]
- *Department for Children and Youth Affairs. (2016). Diversity, Equality and Inclusion Charter and Guidelines for Early Childhood Education and Care.*[15]
- *Government of Ireland (GoI) (2019) First Five: A Whole-of-Government Strategy for Babies, Young Children and their Families*[16]
- *Department of Tourism, Culture, Arts, Gaeltacht, Sport and Media (2019). The Action Plan for Online Safety 2018-2019*
- *Department of Rural and Community Development. Our Public Libraries 2022: Inspiring, Connecting and Empowering Communities*[17]

Aistear, the Early Childhood Curriculum Framework introduced in 2009 by the National Council for Curriculum and Assessment, addresses literacy and numeracy comprehensively through its themes of Communicating and Exploring and Thinking. Aistear is being updated through a commissioned literature review and consultation with children and with wider stakeholder engagement. While Siolta' (DES 2019, 2021) encourages the implementation of a verifiable, broad-based, documented and flexible curriculum or programme, literacy and numeracy are not explicitly named. More specific reference is made to recent policies published by DCYFA and the GoI respectively. *The 'Better Outcomes, Brighter Futures'* policy framework emphasises the development of good literacy and numeracy skills, including digital literacy skills, among all children and young people as "fundamental to the life chances of each individual and essential to the quality and equity of society. Improving literacy and numeracy standards is an urgent national priority" (p.68). *The First Five: A Whole-of-Government Strategy for Babies, Young Children and their Families* makes reference to the NLNS (DES, 2017a), DEIS (DES, 2017b); family literacy and numeracy support programmes and improvement of

[13] https://www.gov.ie/en/publication/97056-nurturing-skills-the-workforce-plan-for-early-learning-and-care-elc-and-school-age-childcare-sac-2022-2028/
[14] https://assets.gov.ie/23796/961bbf5d975f4c88adc01a6fc5b4a7c4.pdf
[15] https://assets.gov.ie/38186/c9e90d89d94b41d3bf00201c98b2ef6a.pdf
[16] https://assets.gov.ie/31184/62acc54f4bdf4405b74e53a4afb8e71b.pdf
[17] https://assets.gov.ie/4278/111218115931-79413828933647aaa21ce9157ee170ba.pdf

literacy and numeracy skills. Literacy initiatives such as Right to Read and Area Based Childhood (ABC) are also mentioned.

Apart from the *Migrant Integration Strategy 2017- 2020,* there is no reference to literacy, digital literacy or numeracy in the policies relating to inclusion. The *Migrant Integration Strategy 2017- 2020* recognises the need to support migrants in acquiring good language skills and includes a commitment to ensure that language supports in schools cater for the language needs of children from ethnic minorities. In contrast, the *National Traveller and Roma Inclusion Strategy 2017-2021* does not make any reference to literacy, digital literacy and numeracy at school.

The final two strategies are interesting. The *Action Plan for Online Safety* represents the Government's first Action Plan for Online Safety. It represents the first effort to set out a coherent plan of the actions that are being undertaken across Government Departments and agencies to protect children and adults in their online engagement. Centred around five goals including online safety for all, the provision of better supports, protections, influencing policy and building our understanding, the development of digital literacy is embedded through the plan. However, reference is not made to other relevant policies or strategies such as the NLNS.

Similarly, the *Our Public Libraries 2022* strategy looks to build on the momentum of achievements under previous strategies. It maintains the focus on developing the library service as an evolving 21st century public service at the heart of communities, while also keeping faith with the general approach of previous strategies. While not explicitly referring to the NLNS, it focuses on three strategic programmes – reading and literacy development, learning and information, and community and culture.

A3. Outcomes Related to the NLNS

A key feature of the National Literacy and Numeracy Strategy has been the establishment of targets, both in the initial strategy document (DES, 2011) and in the interim review (DES, 2017). The targets considered here relate to performance on reading literacy and mathematics, as measured by the National Assessments of English reading and Mathematics at primary level (Second and Sixth classes), and performance on English reading and mathematics on the OECD programme for International Student Assessment (PISA) at post-primary level (15-year-olds). Targets relating to the proportion of students taking higher-level mathematics in the State Examinations and the

proportions engaging in reading for enjoyment, library usage and parent student interactions, are also considered. The section concludes with a discussion on establishing targets and tracking progress against them over time.

Where relevant, targets for students in DEIS schools are briefly described. Readers are referred to the section on DEIS Outcomes in Part A.4 for a more detailed consideration of the DEIS targets.

A3.1 Achievement Targets for Literacy and Numeracy at Primary Level

The following literacy targets were set out for primary level in the NLNS Strategy in 2011:

- *Increase the percentages of primary children performing at Level 3 or higher (i.e., at the highest levels) in the National Assessment of Mathematics and English Reading by at least 5 percentage points at both second class and sixth class by 2020*
- *Reduce the percentage of children performing at or below Level 1 (i.e., minimum level) in the National Assessment of Mathematics and English Reading by at least 5 percentage points at both second class and sixth class by 2020*

The baseline for these targets were the National Assessments of Mathematics and English Reading conducted in 2009. There was a follow-up National Assessment in 2014 that provided an opportunity to monitor progress towards the targets. Originally, it had been intended to implement the National Assessments in 2019. However, because the Trends in International Mathematics and Science Study (TIMSS) was to be administered in 2019, the National Assessments were re-scheduled for 2020. Then, due to COVID-19, the National Assessments did not take place until 2021, with reading assessed at Second class only, and mathematics at Sixth class. The results were not available at the time of writing. In any event, the results for 2021 are likely to be difficult to interpret, since they most likely will reflect effects of school closures during COVID as well as impacts of the Strategy. Hence, the only available information on the extent to which the original NLNS targets for primary level have been achieved relates to 2014. New targets were established in the Interim Strategy Review, but no evidence is available at this time on whether the revised targets have been achieved.

It might be noted that the focus of the original targets in 2011, and the revised targets in 2017, has been on proficiency levels. These are levels of achievement on the reading literacy and mathematics performance scales, developed in conjunction with the

2009 national assessments. They are accompanied by descriptors (content and processes) achieved at each level of performance. For example, students in Second class performing at Level 1 in reading literacy are likely to be able to:

> …. carry out basic retrieval processes and can match words and phrases in the question with the same words and phrases in the stimulus text to answer items. They can also make low-level inferences, where at least part of the information required for the answer is explicitly stated in the text, or where a discrete piece of explicitly stated text coupled with very basic external knowledge is sufficient to answer the question. Pupils at this level can also engage in some interpretation and integration of information, such as identifying an idea or theme in a section of text. They can identify the rationale behind a piece of text where it is clearly flagged (for example, in the title). (Shiel et al., 2014, Table 3.8)

Table 2 summarises performance on reading literacy in the 2009 National Assessments as they relate to the targets set in 2011, the outcomes of the 2014 National Assessments, and the revised targets published in the 2017 Interim Report.

The data show that all four targets for schools in general were achieved by 2014. For example, in the case of Second class, the proportion performing at or below Level 1 (i.e., ‘low achievers’), declined from 35.0% in 2009 to 21.6% in 2014, which was comfortably below the 2011 target of 30.0%.

Table 2: Progress towards Targets for Reading Literacy at Primary Level, Second and Sixth Classes - Percentages of Pupils

	National Assessments 2009 (Baseline)	Target in L & N Strategy 2011	Performance on 2014 National Assessments	2011 Target Achieved?	Revised Target in Interim Review of Strategy (2017)
Second Class (All Schools)					
At or below Level 1	35.0	30.0	21.6	Achieved	20.0
At Levels 3 or 4	30.0	35.0	45.5	Achieved	50.0
Sixth Class (All Schools)					
At or below Level 1	35.0	30.0	24.8	Achieved	20.0
At Levels 3 or 4	35.0	40.0	43.9	Achieved	50.0

The targets for numeracy in the original NLNS strategy document in 2011, were essentially the same as those for literacy (see above). Table 3 provides a breakdown of the targets, and looks at the progress that was achieved in 2014, as well as new targets established in the 2017 Interim Review, which were to have been achieved by 2020.

The table shows that all of the original targets had been achieved by 2014, and that new, more ambitious targets had been set in 2017 (to be achieved by 2020). For example, in the 2014 National Assessments, 42.1% of students achieved Levels 3-4 in mathematics, and this exceeded the target of 40%. A new target of 50% was set out in the 2017 Interview Review.

Table 3: Progress towards Targets for Mathematics at Primary Level, Second and Sixth Classes - Percentages of Pupils

	National Assessments 2009 (Baseline)	Target in L & N Strategy 2011	Performance on 2014 National Assessments	2011 Target Achieved ?	Revised Target in Interim Review of Strategy (2017)
Second Class (All Schools)					
At or below Level 1	35.0	30.0	26.6	Achieved	20.0
At Levels 3 or 4	30.0	35.0	47.2	Achieved	53.0
Sixth Class (All Schools)					
At or below Level 1	35.0	30.0	26.5	Achieved	20.0
At Levels 3 or 4	35.0	40.0	42.1	Achieved	50.0

Although specific targets for DEIS schools were not established in the 2011 Literacy and Numeracy strategy document, targets for DEIS Band One schools were set out in the 2017 interim review (Tables 4 and 5), with reference to the performance of pupils in DEIS schools in the 2014 National Assessments. As with schools in general, because of COVID-19, data were not gathered until 2021, and then only in the case of English reading at Second class and mathematics at Sixth class. In the case of pupils in Second class in DEIS schools, 44% performed at or below Level 1 on reading literacy in the 2014 National Assessments, and a target of 40% was established in the 2017 Interim Review, with this proportion to be achieved by 2020.

Table 4: Targets for Literacy for DEIS Band One schools at Primary Level – Percentages of Pupils

	National Assessments 2014 (Baseline)	Target in Interim Review of Strategy (2017)
Second Class (DEIS schools)		
At or below Level 1	44.0	40.0
At Levels 3 or 4	18.0	25.0
Sixth Class (DEIS Schools)		
At or below Level 1	47.0	40.0
At Levels 3 or 4	21.0	27.0

Source: DES (2017b, p.9)

A3.2 Achievement Targets for Literacy and Numeracy at Post-Primary Level

The NLNS Strategy targets for literacy and numeracy at post-primary level are based on the OECD PISA Study. This study was administered every three years between 2000 and 2018. The 2021 version was postponed until 2022, because of COVID-19. Hence, the last year for which data are available to assess progress on the targets is 2018. Unlike the National Assessments, which are grade-based assessments, PISA is an age-based assessment, and hence students are drawn from more than one year group.

It might be noted that students in Ireland did unexpectedly poorly on both reading literacy and mathematics in PISA 2009 relative to previous PISA cycles, and to subsequent cycles. This was reflected in lower average scores on PISA reading literacy and mathematics in 2009 (Figure 1 and 2), greater proportions of students at or below Proficiency Level 2 (the lowest proficiency levels), and lower proportions performing at Levels 5-6 (the highest proficiency levels). According to the United Nations, Level 2 is the minimum level of literacy that students should have achieved by the end of compulsory schooling (SDG Global Indicator 4.1.1c, United Nations Statistics Division, 2019).

Figure 3 shows the relative stability of PISA average scores on reading literacy in Ireland on an average across OECD countries for PISA cycles occurring between 2000 (when reading literacy was a major domain for the first time) and 2018. In all cycles, with the exception of 2009, Ireland's average score on reading literacy was above the corresponding OECD mean score. For example, in 2018, there was a gap of 31 score points (under one-third of the OECD average standard deviation for reading literacy in 2018) in favour of Ireland.

Figure 4 shows Ireland's average score in mathematics in each cycle between 2003 (when mathematics was a major domain in PISA for the first time) and 2018. In the early cycles of PISA (2003, 2006, 2009), Ireland's mean score was not significantly different from the OECD average, despite Ireland's lower mean score in 2009. From 2012 onwards, Ireland's mean score in mathematics has been significantly above the corresponding OECD average, with a difference in favour of Ireland in 2018 of 10 score points, or one-tenth of the OECD average standard deviation for mathematics in that year.

In overall terms, it can be seen that Ireland's mean performance for mathematics has been lower across PISA cycles than for reading literacy, relative to the corresponding OECD averages. Moreover, performance did not drop to the same extent for mathematics as for reading literacy between 2006 and 2009 (10 score points vs. 31).

In both Figures, it can be seen that, with the exception of 2009, performance in Ireland on PISA has been quite stable. For example, average scores on reading literacy have fallen into the range of 515 to 527 score points, while in mathematics, they have been in the range of 486- 494.

Figure 3: Average Scores on PISA Reading Literacy–Ireland and OECD, 2000-2018

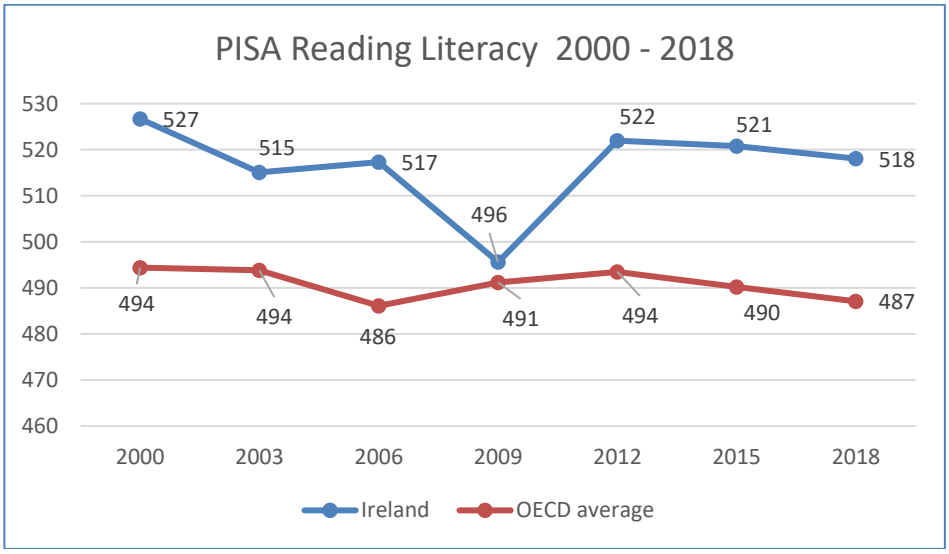
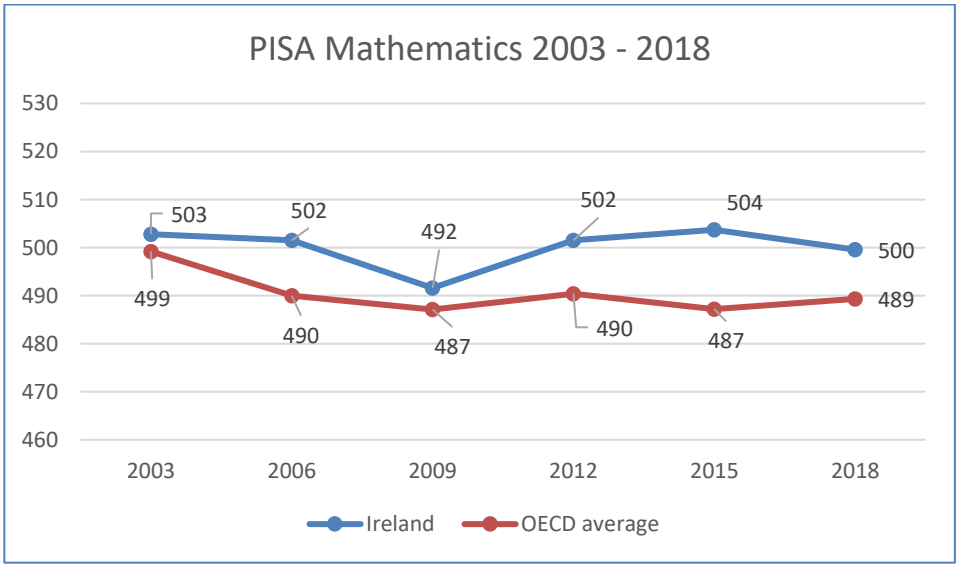


Figure 4: Average Scores on PISA Mathematics – Ireland and OECD, 2003-2018



The initial NLNS included the following targets based on PISA:

- *Increase the percentage of 15-year-old students performing at or above Level 4 (i.e., at the highest levels) in PISA reading literacy and numeracy tests by at least 5 percentage points by 2020*
- *Halve the percentage of 15-year-old students performing at or below Level 1 (the lowest level) in PISA reading literacy and numeracy tests by 2020.*

Table 5 shows performance in reading literacy across recent rounds of PISA, as well as targets for literacy established in the initial NLNS document in 2011 and in the Interim Review in 2017. The first row of data shows the percentages at or below Level 1 in PISA 2009 (17.2%) and subsequent PISA cycles as well as the Strategy targets. The initial Strategy document set a target of 8.5% for 2020. There was improvement between PISA 2009 and 2012, with the proportion at or below Level 1 dropping down to 9.6% by 2012. Since the standard error around the 2012 estimate (0.88) can be used to construct a 95% confidence interval around 9.6%, we get 8.0% to 11.3%. The target of 8.5% is inside this interval. This enables us to conclude that the target of 8.5% was probably achieved. The corresponding interval in PISA 2015, around the estimate of 10.2% at or below Level 1, was 8.6% to 11.8%, meaning that the 2011 target of 8.5% was just outside it. In PISA 2018, marginally more students (11.8%) performed at or below Level 1, compared with 2012 and 2015. The 95% confidence interval around the 2018 estimate was 10.5% to 13.1%. Since 8.5% is outside this interval, it cannot be concluded that the target was achieved in 2018. It might be noted that no country in PISA 2018 had 8.5% or fewer students performing at or below Level 1. In fact, only Estonia at 11.1% and Singapore at 11.2% had fewer students at or below Level 1 than Ireland (11.8%).

The second row of data in Table 5 shows the proportion scoring at or above Level 4 in PISA 2009 and in subsequent cycles, as well as the targets established in the initial Strategy document in 2011 and in the Interim Strategy Review in 2017. In PISA 2009, 28.9% performed at or above Level 4. The target of 34% was exceeded in PISA 2012 (37.4%) and again in PISA 2015 (37.1%). The more ambitious target of 40% established in 2017 was not achieved in 2018 (36.2%, with a 95% confidence interval of 34.2% to 38.2%).

Table 5: Progress towards Targets for Reading Literacy at Post-Primary Level (15-year-olds) based on PISA - Percentages of Students

PISA Proficiency Levels	Position as of PISA 2009		Target for 2020 set in 2011 Strategy	Position as of PISA 2012		Position as of PISA 2015		2011 Target Achieved at Interim	Revised Target for 2020 set in 2017	Position as of PISA 2018		2017 Target Achieved as of PISA 2018?
	%	SE	%	%	SE	%	SE	%	SE	%	SE	
At or below Level 1	17.2	(1.05)	8.5	9.6	(0.88)	10.2	(0.80)	Yes*	8.5	11.8	(0.67)	No
At or above Level 4	28.9	(1.16)	34.0	37.4	(1.11)	37.1	(1.12)	Yes	40.0	36.2	(1.02)	No
At or above Level 5	7.0	(0.53)	No target in 2011	11.4	(0.65)	10.7	(0.65)	Not Applic.	12.0	12.1	(0.67)	Yes

*While the target was inside the 95% confidence interval around 9.6% in 2012, it was just outside the interval around 10.2% in 2015.

The third row of data in Table 5 shows a new target established for the first time in the 2017 Interim Strategy Review – that 12.0% of students would perform at or above Level 5. In PISA 2018, 12.1% performed at or above Level 5, indicating that the target had been achieved.

Hence, where reading literacy is concerned, the 2011 target for the proportion of students performing at or below Level 1 (8.5%) was probably achieved in 2012 (9.6%), whereas in 2015, it was slightly outside the relevant confidence interval. The same target in the Interim Strategy Review (8.5% or lower) had not been achieved by 2018, though the evidence suggests it may be over-ambitious. The 2011 target of 34% at or above Level 4 was achieved by PISA 2012, and the revised target for at or above Level 4 of 40% was not achieved by 2018. On the other hand, a new target for the highest achievers (Levels 5 and 6) of 12.0% was achieved by PISA 2018. In conclusion, most PISA reading literacy targets have been achieved, though this in no small part due to the fact that Ireland's average performance on PISA reading literacy returned to 'normal' levels by 2012, following the dip in 2009.

Table 6 shows performance in mathematics across recent rounds of PISA, as well as targets for literacy established in the initial NLNS document in 2011 and in the Interim Review in 2017. The second row shows that, while 20.8% performed at or below Level 1 in PISA 2009 (i.e., the students were low achievers in mathematics), this dropped to 16.9% by 2012 – a sizable improvement, though below the 2011 target of 10.5%. The third row shows that 29.9% achieved Level 4 or higher in 2009. By 2012, this had increased to 30.9%. If we set up a 95% confidence interval around this value (29.1% to 32.7%), we see that it contains the target value of 31%, and hence we can conclude that the target was achieved by 2012. In PISA 2018, 29.1% performed at Level 4 or higher. The confidence interval around this estimate (27.0% to 29.1%) does not include the revised target of 34% set in the Interim Strategy Report in 2017. Hence, the revised target was not met. Finally, a target of 13% of students performing at Levels 5-6 (high achievers) was established in the Interim Strategy Review in 2017. This was not achieved in PISA 2018, when 8.2% of students in Ireland performed at these levels.

Table 6: Progress towards Targets for Mathematics at Post-Primary Level (15-year-olds) based on PISA – Percentages of Students

PISA Proficiency Levels	Position as of PISA 2009		Target for 2020 set in 2011 Strategy	Position as of PISA 2012		Position as of PISA 2015		2011 Target Achieved at Interim	Revised Target for 2020 set in 2017	Position as of PISA 2018		2017 Target Achieved as of PISA 2018?
	%	SE	%	%	SE	%	SE			%	SE	
At or below Level 1	20.8	(0.97)	10.5	16.9	(0.99)	15.0	(0.89)	No	10.5	15.7	(0.82)	No
At or above Level 4	26.1	(1.20)	31%	30.9	(0.91)	31.0	(1.0)	Yes	34	29.1	(1.06)	No
At or above Level 5	6.7	(0.65)	No target in 2011	10.7	(0.54)	9.8	(0.58)	Not Applic.	13	8.2	(0.67)	No

A3.2.1 Mathematics in the Certificate Examinations

A target was set in the 2011 Literacy and Numeracy Strategy for 30% of candidates to take the Higher-level mathematics examination at Leaving Certificate level by 2020. By 2016, when the Interim Review was being prepared, 28% of candidates took Higher-level mathematics at Leaving Certificate level. The target of 30% was reiterated in the 2017 Interim Review, and, by 2019 (the last 'normal' pre-Covid sitting of the Leaving Certificate examination), 33% sat Higher-level mathematics, indicating that the target had been achieved (Table 7).

A parallel target for Junior Cycle mathematics of 60% sitting Higher level mathematics was established in 2011, and was reiterated in the Interim Review in 2017. The target sought to increase the proportion of candidates taking the Junior Cycle mathematics examination from 45% in 2011 to 60% by 2019. In 2019 (the last year for which Junior Cycle mathematics results are available), 59% took Higher-level mathematics, meaning that the target was almost achieved. As the JC data represent population data, confidence intervals are not established, as they were for PISA, where a sample of schools and students is involved in each cycle.

It might be noted that factors other than the NLNS may have contributed to reaching the Leaving Certificate target of 30%. Key among these is the availability of 25 CAO bonus points for achieving a grade H6 or higher since 2012. The implementation of Project Maths may also have been a factor, though it is difficult to disentangle these two initiatives as they operated in parallel for several years.

The increase in the proportion of students taking the JC Higher-level mathematics examination may also be due to availability of bonus points for sitting LC Higher level, since sitting JC Higher level (and, perhaps, achieving a 'Merit' or higher) can serve as a route into LC Higher-level classes in some post-primary schools.

Table 7: Progress towards Targets for Take-up of Mathematics in State Examinations – Percentages of Students

	Position as of 2011	Target for 2020 set in 2011 Strategy	Position as of 2016	Target Achieved by Interim Review?	Target Established in Interim Review	Position as of 2019	Target Achieved by 2020?
Junior Cycle Mathematics: Higher Level Candidates	45	60	55	No	60	59	Almost
Leaving Certificate Mathematics: Higher Level Candidates	17	30	28	Almost	30	33	Yes

Sources: DES (2017) and State Examinations Commission (examinations.ie), JC and LC results for 2016 and 2019.

A3.3 Other Targets for Literacy and Numeracy at Primary and Post-Primary Levels

A3.3.1 Reading for Enjoyment

The 2011 NLNS document recognised the importance of fostering a liking of reading in young children and set as a target the 'foster[ing] and enjoyment of reading among children and young people'. However, the 2011 target was not measurable. In the Interim Review in 2017, the following targets were set:

- *Increase the percentage of parents who strongly agree that they set aside time for their child to read for fun or enjoyment on most days to 45% by 2020, from 37% in NAERM 2014.*
- *Increase the proportion of boys reading on a daily basis to at least 60% and the proportion of girls to at least 70% by 2020, from 52% (boys) and 64% (girls) in PISA 2012.*

The first target cannot be assessed at this time, as NAERM was not administered until 2021 (due to COVID-19), and results have not yet been published. PISA 2018 provides information on the second target. In 2018, 61% of female students reported that they read for enjoyment for at least some time on a daily basis, while 44% of males did so. Hence, the targets for post-primary students have not yet been achieved. However, this must be considered in the context of an average decline in reading for enjoyment across OECD countries since 2009, when the question was last posed at international level, as well as the increased engagement of students with technology, including social media, which might be expected to curtail time for reading continuous text for enjoyment. Nevertheless, there continues to be a strong association between frequency of reading for enjoyment and student performance on reading literacy in PISA (Shiel et al., 2022), suggesting that sustained reading activity is still important for adolescents.

A3.3.2 Library Usage

The 2017 Interim Review included the following target relating to library usage among students approaching the end of primary schooling:

- *Increase the percentage of pupils in sixth class who borrow books from a public library at least monthly to 60% by 2020, from 47% of pupils in NAERM 2014.*

No current data are available relating to this target as NAMEM did not take place until 2021 (due to COVID-19), and results had not been published at the time of writing.

A3.3.3 Interaction with Parents on Educational Matters

An important wellbeing indicator in PISA is the proportion of students who report that their parents discuss with them how well they are doing at school several times a week. The Interim Review set the following target:

- *Increase the percentage of 15-year olds who report that their parents discuss with them how well they are doing at school several times a week to 60%, from 56% in PISA 2015.*

In PISA 2018, 51.9% of students reported discussing their progress in school with their parents several times a week, a 4.2% decrease from PISA 2015. A change in the opposite direction would be needed to achieve the target of 60 percent.

A3.4 Early Childhood Education and Teacher Education

The Literacy and Numeracy Strategy (Department of Education and Skills, 2011) identified the importance of early childhood education and teacher quality and professional practice to support improved learning in the areas of literacy and numeracy. The quality of very young children's experiences has been enhanced, generally, through increased qualifications in the ECEC sector. In 2010, at the introduction of the universal, funded Early Childhood Care and Education (ECCE) programme for one year before formal schooling, there was no minimum qualification for staff. The ECCE contract specified that 'room leaders' should have a National Framework for Qualifications (NFQ) Level 5 qualification. The mandatory minimum qualifications for those working in ECEC commenced in 2016. The ECCE programme contractual requirement was raised to Level 6 (NFQ). There is also a requirement in the ECCE contract that services must provide “an appropriate educational programme” that “adheres to the principles of Síolta and Aistear” (DCEDIY, 2022).

There was an expansion, validation and further development of relevant education and training programmes from levels five to nine on the NFQ and through the introduction of professional award-type descriptors at NFQ levels five to eight by Quality and Qualifications Ireland (QQI, 2019). This development continued with the introduction of new courses by further and higher education providers and the publication in 2019 of Professional Award Criteria and Guidelines for initial professional

education (level seven and level eight) degree programmes in ECEC (DES, 2019). Early literacy and numeracy, language acquisition and multilingualism are included in the essential programme content. A Qualifications Advisory Board was established in 2020 to assess degree programmes against these Criteria and Guidelines.

A range of commitments to strengthen the infrastructure that supports the early childhood system is provided in *First 5, the Whole-of-Government Strategy for Babies, Young Children and their Families, 2019-2028* (GoI, 2019). These commitments include a “skilled and sustainable professional workforce". The Strategy sets a goal of at least 50% of staff working directly with children in centre-based settings holding an appropriate degree-level qualification by 2028 (GoI, 2019, p.110). Other significant commitments in First 5 include the development of Ireland’s second workforce development plan. Nurturing Skills: The Workforce Plan for Early Learning and Care and School Age Childcare, 2022 – 2028, was published in 2022 (DCEDIY). The commitments made in Nurturing Skills include the full rollout of the National Síolta Aistear Initiative (NSAI) by 2028. The rollout of the NSAI will include redeveloping professional learning and development resources with a combination of face-to-face and online delivery (DCEDIY, 2022).

Initial teacher education (ITE) courses and the recruitment of the most-able students were given a critical role to develop teacher professional knowledge, understanding and the ability to apply educational theory. One action arising from this recognition was to increase the length of undergraduate B.Ed. primary ITE programmes from three to four years and postgraduate diploma primary programmes to a minimum of two years. The content of ITE programmes in literacy and numeracy was also revised to include a greater emphasis on areas such as first and second language acquisition, assessment, children with SEN, EAL learners, Irish-medium settings, digital literacy, and partnerships with parents. Modules in literacy and numeracy are mandatory on all ITE programmes. School placement was extended to 30 weeks in the case of the undergraduate and 24 weeks for the postgraduate ITE programmes.

The NLNS also resulted in the consolidation of teacher education into six centres of excellence as recommended in the Sahlberg (2012) report. Excellent progress towards this goal was reported in the follow-up Sahlberg (2019) review of the structure of teacher education. The extended time on ITE programmes has enabled an increase

in input to numeracy and literacy modules combined with extra practice in schools. These programmes are led by expanded teams of research active teacher educators.

In relation to review of entry requirements into ITE as referred to by Department of Education and Skills (2017) and the raising of the minimum entry requirements for Mathematics, English and Irish, the Teaching Council issued new *Céim* standards which did not recommend any increase (The Teaching Council, 2020). The decision not to increase the entry requirements may have been influenced by a research report by Darmody and Smyth (2016) and commissioned by the Teaching Council. This report noted the trade-off between higher entry grades and student diversity on ITE programmes. Nonetheless, the very low entry grades for mathematics and English which stand at H7 on the Leaving Certificate higher level paper or O4 on the ordinary level paper (Department of Education, 2020) might have been examined further. In stating this, it is acknowledged that very few students gain entry with such low grades.

In relation to literacy and numeracy, the *Céim* standards state that,

> Literacy and Numeracy: Programme design shall ensure that student teachers are afforded opportunities to enhance their own literacy and numeracy and are required to demonstrate an acceptable level of proficiency in literacy and numeracy. Students shall be required to demonstrate their competence in teaching and assessing literacy and numeracy appropriate to their curricular/subject area(s). (The Teaching Council, 2020, p. 12)

This stipulation applies to all programmes of ITE at primary and post-primary. The "use of digital technologies to support teaching, learning and assessment for all learners" (The Teaching Council, 2020, p. 12) is also noted. Digital literacy across the continuum of teacher education was identified as a priority in the NSLN interim review (Department of Education and Skills, 2017).

A4. Outcomes of the NLNS related to DEIS in ECEC, Primary and Post-Primary

This is a summary of a longer paper on Research Outcomes Related to DEIS.[18]

[18] Shiel, G., French, G. Kennedy, E., & McCormack M. (2022). *Impact of the DEIS Strategy and National Literacy and Numeracy Strategy at ECEC, Primary and Post-Primary Levels*. Dublin: DCU. https://doi.org/10.5281/zenodo.7881815

A4.1 Early Childhood Education and Care[19]

Early childhood is a critical and sensitive period in setting the foundation for later life (UNICEF, 2019). Early childhood is a time of rapid development and neuroscience highlights that by six years of age a child's brain has reached about 90% of its adult volume (Shuey & Kankaras, 2018). At this crucial time in life, high-quality Early Childhood Education and Care (ECEC) plays a key role in supporting success in school and later life (UNICEF, 2019; Organisation for Economic Co-operation and Development, [OECD], 2008). Whilst high-quality ECEC benefits all children (Council of European Union, 2011); multiple studies demonstrate that, for those experiencing poverty and educational inequality, the impact of high-quality ECEC is profound and can lead to better school achievement, higher cognitive scores and higher retention rates (OECD, 2018; Taggart et al., 2015). In the context of educational inequality, there is evidence that economic deprivation at a very young and sensitive time of development, may disproportionally compromise children's life chances and research highlights strong links between early poverty and subsequent educational outcomes (Duncan et al., 2011).

A substantial body of literature highlights the importance of literacy and numeracy across the life span (OECD, 2021). Indigenous research (Kennedy et al., 2012) attests to the correlation between poor literacy/numeracy outcomes and socio-economic demographics. Considerable policy attention has centred on literacy and numeracy (Department of Education and Science [DES], 2005; DES 2009; DES, 2017), over the past two decades as it relates to children in primary school. ECEC in Ireland has experienced rapid transformation since 2006. Consequently, the focus on literacy and numeracy as it relates to the younger age group is best understood in the broader context of policy and practice developments to enhance the quality of children's experiences and their learning and development.

4.1.1 Early Childhood Education and Care (ECEC) Context

The late 1960s saw growing interest in the area of educational disadvantage or inequality. In 1969, with support from the Bernard van Leer Foundation, the Rutland Street Project was established in north inner-city Dublin. This was a pre-school intervention initiative that aimed to support the cognitive skills of young children between the ages of three and five years in preparation for the transition to primary

[19] With thanks to Marlene McCormack, DCU IoE, for her contribution

school. The Rutland Street Project formed the blueprint for the later development of the Department of Education programme, Early Start, which remains a pilot to this day. Early Start is an educational initiative, which commenced in 1994 and comprises 40 pre-schools targeted to areas of urban disadvantage. The programme draws on earlier research (Barnett, 2001), which suggests that pre-school education supports large gains in reading achievement for children experiencing inequalities and disadvantage. The policy focus on early childhood education and literacy and numeracy in particular stagnated until the release of the *White Paper, Ready to Learn* (Government of Ireland, 1999) which foregrounded the detrimental long-term effects of educational disadvantage on children's learning and development and the importance of ECEC. The White Paper signalled Government intent to progress the development of high-quality preschool education for young children, with a special emphasis on those experiencing disadvantage. From the White Paper, *Síolta, the National Quality Framework* (Centre for Early Childhood Development & Education, [CECDE], 2006) and *Aistear*, the Early Childhood Curriculum Framework (National Council for Curriculum and Assessment, [NCCA], 2009) emerged, both of which guided early childhood educators in supporting learning.

Síolta (CECDE, 2006) was introduced to the sector through a limited national roll-out of awareness raising workshops (2006-2008), the development of a Quality Awareness Programme (QAP) (2009-2013) which incorporated mentor training along with professional development sessions, and a QAP Validation process (2012), which enabled settings to submit self-evaluation documentation and portfolios to achieve specific ratings against each Síolta Standard. *Aistear* (NCCA, 2009) was initially operationalised through the Aistear-in-Action programme with Early Childhood Ireland (ECI) (2011-2013). Subsequently, the Aistear Síolta Practice Guide (2015) was developed, which aimed to provide resources to the sector, some of which focused on supporting emergent literacy and numeracy. In addition to the quality (Síolta) and curriculum (Aistear) frameworks, a third document of relevance to diversity and equality, supports the development of quality professional practice in the Irish ECEC environment. The Diversity, Equality and Inclusion Charter and Guidelines for Early Childhood Education and Care (DCYA, 2016) are more broadly oriented towards equity through a comprehensive Anti-bias approach to ECEC practice, the document makes reference to literacy in the context of diverse family backgrounds.

A national survey conducted in 2015 by the DES indicated educators' concerns in relation to the level of preparedness in implementing and delivering Síolta and Aistear (DES, 2018). The survey guided the development of the National Síolta Aistear Initiative (NSAI) in 2016, which aimed to target a more coordinated roll out of the national frameworks. A review of the NSAI (DES, 2018) highlighted that greater strategic direction and coherence with other quality related developments in the ECEC sector are required. From the perspective of educators in the settings, the issues of consistent access to support in implementing the frameworks and fragmentation in messaging needs to be addressed. Whilst there are a number of supports (e.g., Better Start mentoring support, Leadership for Inclusion programme and City and County Childcare Committees) available to the sector, it appears that consistent and accessible guidance is required for the effective implementation of the national frameworks, which support children's learning and development.

The DEIS programme was launched (Department of Education and Science [DES], 2005) as a social inclusion action plan and it aimed to assist schools and their communities to achieve equality in educational participation and outcomes. Within the DEIS programme emphasis was placed on the importance of early intervention in primary schools. Transitions have always been a key theme under DEIS, including the important transition into primary school from an early years setting or the home. Parents are encouraged to enrol their children in ECEC settings. The DEIS plan aimed to add value to preschool provision in communities with high concentrations of disadvantage but omitted to include ECEC within the implementation action or budgetary frame at that time. The revised Plan (DES, 2017) signalled some further interest in early childhood education, committing to developing best practice and piloting new initiatives that could be mainstreamed over time in respect of ECEC. While the ECEC sector was identified in the context of strengthening links between preschools and primary schools, 'school readiness', interagency working and effective transitions. However, First 5 (GoI, 2019) has a strong commitment to the development and implementation of a DEIS-type model for the ECEC sector. DEIS has a significant focus on supporting literacy and numeracy and a model of wrap-around supports, which will augur well when implemented in ECEC settings that work in the context of educational inequalities. A DEIS-type model would have a distinct advantage of being informed by the experiences and successes of the programme in Primary schools to date and may

include additional funding to settings for small staff/child ratios, family liaison staff, additional parent support and the provision of food.

The NLNS (DES, 2011) explicitly acknowledged the important role of early childhood education in fostering literacy and numeracy development alongside professional counterparts in primary and post-primary schools. Among the priorities emanating from the strategy were the need to prioritise literacy and numeracy in ECEC, to create a culture of continuous improvement and to support the pedagogical skills of those professionals working with young children. The strategy recognised the role of parents in supporting literacy and numeracy and paid particular attention to those families experiencing poverty, social exclusion and educational disadvantage.

The interim review and revised targets (DES, 2017) for the NLNS highlighted advancements in the ECEC sector. They include significant numbers of young children availing of the ECCE scheme, increased qualification levels amongst the workforce, greater range of supports available to the sector and the introduction of education-focussed inspections, all of which position and enable ECEC settings to more effectively target and support literacy and numeracy. The Interim Strategy Review identified the key step-changes and targets included in the Strategy, some of which have been achieved to date (e.g., see A3.4 Early Childhood Educator and Teacher Education) and which will impact positively on the pedagogical work with children in the area of literacy and numeracy.

In the absence of national literacy and numeracy programmes for ECEC, much significant work has been undertaken in locally implemented initiatives. First 5 commits to improving literacy and numeracy and to draw on learning accrued from these local initiatives for future plans, particularly in relation to the development of a DEIS-type model for ECEC. First 5 acknowledges that progress has been made in prevention and early intervention initiatives under the umbrella of Area Based Childhood (ABC) Initiatives, the National Early Years Access Initiative (NEYAI), and other developments rolled out through statutory, voluntary and community organisations. The main purpose of these programmes is to improve outcomes for children and families living in areas designated as disadvantage in Ireland. The ABC Programme (2013-2017) was a prevention and early intervention initiative. The programme targeted investment in evidence-based/informed interventions. The NEYAI (2011-2014) had multiple aims relating to young children (birth-6 years). Of particular relevance is the focus on

influencing practice and provision in early childhood settings. A number of projects supported by NEYAI and/or ABC focused on language, literacy and numeracy. In the absence of a developed body of literature, systematic reviews or meta-analyses emerging from the Irish context, in relation to early childhood education (i.e., literacy and numeracy in areas of socio-economic inequality), these projects signpost valuable learning, which can inform future developments. Consequently, learning from these exemplars warrants some consideration. Some of the projects are outlined as follows.

Happy Talk is a project which adapted a community-based, targeted and universal approach to improving the speech and language outcomes of children (birth-6 years). Core to Happy Talk was a focus on engaging parents, supporting them as active participants in their children's language and literacy learning. Effective strategies that emerged through the final project evaluation (Exodea Consulting, 2014) included building relationships, coaching parents, developing interagency collaborations, training/educating early childhood educators, and enriching learning environments. Happy Talk identified that through working together and utilising community-based interventions, which focused on relationships and active learning interventions, measurable gains were made in children's language development.

Early Years Language and Learning Initiative, a project of the NEYAI, centred on a Language Enrichment Programme which included 'Teacher Talk' training sessions, parent and child education sessions called 'Chatter Matters' and a 'Listening Group'. The Programme focussed on the language, literacy and social experiences which are mainly mediated through interactions between early childhood educators, parents and children (French, 2014). Findings indicated that there were improved practices in participating early childhood settings across a number of areas, with educators having increased awareness of children'' speech and language. The Programme resulted in increased scores on the Programme Quality Assessment (PQA) tool, across the areas of adult-child interaction, namely, 'support for child communication', 'encouragement of child initiatives', 'support for child learning at group times', 'opportunities for child exploration', 'encouragement for peer interaction', and 'independent problem solving'. An evaluation of the programme also identified higher scores on the dimensions of environmental print, book and literacy areas, reading stories, emergent writing, counting, shape and space and simple numbers.

The Early Years Numeracy Project, National College of Ireland (NCI), is a project which set out to improve educational outcomes in numeracy for participating children and families in the Dockland area, a designated area of disadvantage. The project was underpinned by research that indicated low levels of numeracy in the Docklands area as well as the lack of support for parents in mathematics (Early Learning Initiative, [ELI], 2010). National reports also emphasised how young people in Ireland were poorly prepared for future mathematical needs as students and citizens (Eivers, et al., 2010). The Numeracy project worked directly with parents and children to foster greater mathematical awareness, competence and confidence in everyday life. The findings emanating from this project highlighted the power of community action research, the need for parental engagement, and for multiple strategies that enable parental involvement and a community-wide focus.

Doodle Den, an after-school programme designed to promote young children's literacy, was initiated in one designated area of social and economic inequality in west Dublin. The programme targeted young children aged 5-6 years (Junior/Senior Infant classes) and involved them in participating in 3 after-school sessions per week over a 3-year period. The programme was evaluated through a randomised control trial and a qualitative process evaluation focusing on implementation (Biggart et al., 2012). Findings indicated an improvement in children's comprehension, sentence structure and word recognition. There was also a positive impact on children's concentration and reading at home, in addition to increased family library activity. Given the positive outcomes from the programme, it was recommended that it should be further developed, expanded and re-evaluated to determine if benefits for children hold well over time.

Consistent indicators of success across the programme evaluations suggest the importance of collaboration at a community level, which centres on networking, building interagency collaborations and linking key stakeholders that include ECEC settings, primary schools and local voluntary agencies. Authentic engagement with parents was core to many programmes and included an element of coaching and supporting, while creating conditions that facilitate parental engagement. Finally, there was a common focus on professionally developing early childhood educators, affording them learning opportunities, specifically in relation to deepening interactions between adults/children

and children/children; developing literacy- and numeracy-rich pedagogical practices and creating enriching learning environments.

Conclusion

A robust international body of literature accepts the importance of young children as confident and competent readers, writers and mathematicians. The challenges for young children experiencing poverty, inequality or marginalisation are well documented. In considering literacy and numeracy with a strong focus on education, there is also a need to tackle food poverty, to extend the network of parental and community supports and to ensure child health measures from the start, which are part of the First 5 programme. Early childhood education is on the national agenda and, while significant gaps continue to exist in relation to educational inequality and literacy and numeracy in ECEC, First 5 has committed to addressing these issues, drawing on evidence-based research and taking lessons from local project initiatives, which have demonstrated success.

Early childhood is a sector and profession, which has and continues to undergo significant changes in policy and practice, with First 5 setting out an overarching blueprint for sectoral development (2019-2028). Within the commitments made in First 5, the National Childcare Scheme (NCS) will substantially improve the affordability of ECEC and School Aged Childcare for families. *Nurturing Skills* (DCEDIY, 2022) maps out a vision and implementation plan to meet workforce related targets (2022-2024) and the introduction of a new Core Funding Scheme aims to support pay and conditions in the sector, thus providing for stability and sustainability into the future. The commitment of an additional €403 million announced in Budget 2023 (O'Gorman, 2022) brings current investment in the sector to more than €1billion. The system currently under development, when realised, will enable a concerted and coherent commitment to improving educational outcomes for all children, particularly those experiencing inequalities. The rate and pace of change for all participant stakeholders within, and associated with, the ECEC sector has not been without its challenges and hence the focus on literacy and numeracy in early childhood can only be examined in the broader context of policy and practice developments. As suggested by Bleach (2015, p.32), arising out of the NEYAI Numeracy Project in the Docklands, 'change cannot happen in a vacuum' and central to improving children's literacy and numeracy

outcomes will be the ability of First 5 to meet its actioned commitments in the coming years'.

A4.2 Impact of DEIS at Primary Level on Literacy and Numeracy [20]

As noted above, the *Rutland Street Project* (Department of Education [DE], 1969) and *Early Start* (DES, 1994) delivered early intervention to a small number of early years' settings. It was followed by the *Breaking the Cycle* initiative (DES, 1996) which provided increased funding, improved staffing and lower teacher-pupil ratios (15:1 in junior classes; 20:1 senior classes) in the 33 primary schools identified as the most disadvantaged in the country. While such investment was critical in helping schools compensate for the high levels of poverty often experienced by their pupils, it was not sufficient to radically change educational outcomes for pupils (Archer & Weir 2004; Weir, 2003; Eivers et al., 2004). Hence, the DES[21] embarked on the large-scale ambitious initiative, *Delivering Equality of Opportunity in Schools* (DES, 2005a), targeting *all* schools (urban and rural) designated as disadvantaged. Under new guidelines, urban schools were further divided into bands according to levels of disadvantage and location, with Band One identified as most disadvantaged urban band. Features of earlier initiatives were retained including provision for lower class sizes (20:1 in Junior classes and 24: 1 in senior classes of DEIS Band One) and greater funding and staffing allocations based on level of disadvantage.

The DEIS strategy also differed from earlier initiatives in a number of ways. First, schools were asked to create three-year action plans to include: (a) specific literacy and numeracy achievement targets and development plans for how progress toward achieving the targets would be monitored; (b) strategies to improve attendance; and (c) strategies to enhance parental involvement. Second, in line with national research recommendations (DES, 2005b; Eivers et al., 2004), school-based professional development for literacy was provided under the newly formed Professional Development Service for Teachers (PDST) and included guidance on whole school planning for literacy. In addition, training in relation to *Reading Recovery* (e.g., Clay,

[20] This section is based on a longer paper: Shiel, G. French, G., Kennedy, E., & McCormack, M. (2022). *Outcomes of the National Literacy Strategy in Relation to DEIS in early childhood education, primary and post-primary*. DCU. https://doi.org/10.5281/zenodo.7869158

[21] In 2020, the Department of Education and Skills (DES) reverted to the Department of Education (DE), as originally named in 1921

1993) and *First Steps* (Education Department of Western Australia, 1994) was offered to Band One schools in year one and extended further over the next few years.

Other supports provided within the strategy included access to: (a) homework clubs and summer camps designed to assist literacy and numeracy development; (b) Home-School-Community Liaison (HSCL) services (including literacy and numeracy initiatives involving parents and family members, such as paired reading, paired maths, *Reading for Fun, and Maths for Fun*); and (c) transfer programmes supporting progression from primary to second-level.

As noted above, other supports for the DEIS context have come via the 10-year National Literacy and Numeracy Strategy for Children and Young People (NLNS, DES, 2011) first introduced in 2011 and reviewed and revised in 2017 (DES, 2017). Six key pillars of the NLNS set out policy, implementation actions and timelines for delivery across the continuum of schooling in relation to parental involvement, reform of teacher education, school leadership, inclusion, curriculum reform and accountability (see Kennedy, 2013 for discussion). While the six pillars were designed to impact positively on the literacy and numeracy development of *all* children regardless of socio-economic status, a particular emphasis was put on DEIS in Pillar 5: Addressing the Needs of Diverse Learners. In addition, guidelines on School Self-Evaluation (DES, 2012, 2016) were issued to all schools to support them in identifying areas for improvement and in developing three-year action plans.

The DEIS strategy has been externally evaluated by the Educational Research Centre at regular intervals since its inception. A number of reports have been published on the progress of both urban schools (Weir et al., 2011; Weir & Denner, 2013; Kavanagh, Weir & Moran, 2017; Weir et al., 2018; Kavanagh & Weir, 2018) and rural DEIS schools (Weir, Archer & Millar, 2009; Weir et al., 2015; Weir & McAvinue, 2013). It has also been possible to compare the progress of DEIS schools with non-DEIS schools, drawing on data from the National Assessments of English Reading and Mathematics (NAERM, Shiel et al., 2014; Kavanagh et al., 2016) which includes a representative sample of DEIS schools. Additionally, the impact of the HSCL coordinators has been examined through analysis of questionnaires administered to all primary and post-primary HSCL coordinators (Weir et al., 2018), with comparisons made with previous studies of the scheme (e.g., Archer et al., 2003). As well as these external reports, the Inspectorate of the DE has compiled a number of reports based

on their inspection visits to DEIS schools (e.g., Inspectorate, Department of Education and Skills, 2015a, 2015b).

The external evaluations of the DEIS strategy have predominantly focused on monitoring achievement in literacy and numeracy as measured by national standardised tests of reading and mathematics achievement. Other quantitative measures include questionnaires to principals, teachers, parents and, children which have shed light on classroom practices, expectations, future aspirations, factors enabling and constraining progress, resourcing issues and affective dimensions of literacy and numeracy such as motivation, engagement and sense of self-efficacy known to impact on achievement. Qualitative data derived from focus group interviews with principals of DEIS Band One schools, many of whom participated in the evaluations on four occasions, have contributed to a more nuanced understanding of the impact of the DEIS strategy beyond the outcomes based on achievement data. Finally, ESRI research (Smyth et al., 2013) commissioned by the DES, synthesised DEIS evaluations to 2013, and drew on a wider range of research including the *Growing up in Ireland* (GUI) study to make recommendations for the sector. A synthesis of findings from this body of research completed as part NLNS tender (see Shiel et al., 2022a) is summarised here to highlight key achievements under the DEIS strategy and NLNS and continued challenges.

First, a brief summary of the views of HSCL coordinators in relation to the impact of the scheme are presented with reference to the nature of their role and the successes and challenges encountered, as reported in Weir et al. (2018). The second section outlines achievement outcomes in literacy and numeracy at primary level and reference is made to differential outcomes for DEIS Band One, Band Two and Rural DEIS. Where relevant, comparisons are made with results of the NAERM (2014). Additionally, the influence of motivational and self-efficacy factors on achievement are highlighted. The third section summarises the achievement outcomes in literacy and numeracy at post-primary level in relation to PISA and state exams.

A4.2.1 Implementation and Impact of the Home-School-Community Scheme

The HSCL scheme was first established as a pilot project in designated areas of disadvantage in 1990. Thirty-one teachers were appointed as HSCL coordinators in 55 primary schools and was extended to 13 post-primary schools serving concentrations of students from the original 55 primary schools (Archer & Shortt, 2003).

In 2005, with the introduction of the DEIS strategy, all urban primary schools and post-primary schools participating in the School Support Programme were entitled to have access to the HSCL scheme. While rural schools were entitled to a HSCL coordinator shared between a cluster of schools, that aspect was discontinued in 2011 (Weir et al., 2018). Since 2014, services under the HSCL scheme and the National Educational Welfare Board are administered by Tusla (the child and family agency). Since 2013 teachers appointed to the role serve a term of five years. The HSCL role is a key dimension of the DEIS strategy and is intended to maximise the participation of the children in school, to enhance links between home, school and relevant community agencies to best serve the needs of children. It also seeks to raise parental awareness of their capacity to support their child's school progress and to support them in developing their skills to do so. Additionally at post-primary level, it aims to enhance children's participation in and retention in school and their uptake of further education after compulsory schooling. An essential dimension of the role is visits to the home.

Previous evaluations of the HSCL scheme occurred in 1991/1992 and 2000/2001. In 2017, questionnaires were sent to all HSCL coordinators (413 in 2016-2017) and in the region of three quarters were returned (e.g., 77.1% primary level, 77.5% post-primary level). In each evaluation, the HSCL scheme has been highly valued and has been identified as a key support to DEIS schools in creating and maintaining home school links and interagency cooperation.

In 2016-17, questionnaires investigated how coordinators spend their time, their views on levels of parental involvement in schools, their relationships with families, difficulties encountered in the role, issues faced by families and their views on the success of the scheme and levels of satisfaction with the support provided to them under the scheme. Findings from the survey were organised around six themes and, where possible, comparisons were drawn with previous studies of the scheme conducted in 1991/1992, 2000/2001. The themes included how coordinators use their time, their perception of the nature and extent of parental involvement, perceptions of problems facing families, level of collaboration with other agencies, the impact of the HSCL scheme on families, communities and schools and coordinators' level of satisfaction with the supports available to them under the scheme.

The largest proportion of HSCL coordinators' time (21%) was spent on home school visits though this varied somewhat by sector (18% primary; 22% post-primary).

It is noteworthy that the percentage of time allocated to home visits was well below the percentage advocated by TUSLA and the DES (33%) and had decreased since 1991/1992 and 2000/2001 (when it was 26% and 30%, respectively). Weir et al. (2018) surmise that the reduction may be due to *'issues such as homelessness, crime and substance misuse, issues which most coordinators indicated were prevalent among families served by their schools*' (p.50). This interpretation is borne out by the findings in relation to the range of issues facing families. HSCL co-ordinators indicated that the following problems affected families 'to a great extent': poor oral language (79%), emotional/behavioural difficulties (74.7%), unemployment (63.4%), general family dysfunction (61.9%), and literacy and numeracy problems among parents (53.4%). They were also more likely to identify homelessness (23.6%), poor housing quality (32.6%) and substance abuse among families (33.3%), compared to post-primary coordinators (5.7%, 11.4%, 17.2% respectively). The factors most often identified by post-primary coordinators were emotional/behavioural difficulties (74.7) and ongoing student absenteeism (69.1%) and effects of general dysfunction (45.1%). Other factors also highlighted by smaller proportions of coordinators included poor diet, bullying, domestic violence and organised crime. Such factors underscore the need for policy to address the wider social and inequality issues at the root of literacy and numeracy difficulties.

There was evidence that interagency collaboration and contact with community partners and organisations was facilitated and supported by the HSCL coordinators with about half reporting that time spent on such activities had increased over time. High proportions of coordinators highlighted a wide range of activities that parents were involved in at school (e.g., recruiting participants for courses and activities, extra-curricular activities, fundraising) and the majority were of the opinion that parental involvement in their schools had increased as a result of the HSCL scheme. At primary level there were greater proportions of parents involved in in-school activities than parents at post-primary. Other benefits of the HSCL scheme highlighted by coordinators included improved home-school relationships, greater participation of parents in educational activities and improved parental self-confidence and self-esteem. Overall, HSCL coordinators were satisfied with supports (e.g., funding, access to advice, principal support) available to them in their role. However, they highlighted the need for greater access to professional development which 29% indicated had impacted to some extent on the success of the scheme.

4.2.2 Achievement Outcomes in Literacy and Mathematics at Primary Level [22]

Literacy achievement in DEIS evaluations has been measured using the Drumcondra Sentence Reading Test (ERC, 2007), a protected 40-item multiple choice test which requires children to choose an appropriate vocabulary word to suit a particular context presented in a single sentence. Achievement in mathematics was assessed using a shortened version of the Drumcondra Primary Mathematics Test Revised (DPMT-R, ERC, 2006). As part of the DEIS evaluation, the tests were first administered in May 2007 to students in Second, Third and Sixth classes and again in May 2010, 2013 and 2016 (Fifth class was also included from 2010). A total of 120 DEIS Band One urban schools participated on all 4 occasions.

4.2.2 Literacy Achievement in DEIS Evaluations

As can be seen in Table 8, relatively small gains in achievement were reported between the first and second DEIS evaluations but were statistically significant (Weir et al., 2011). Of the cohorts tested in 2007, Second class had the highest average standard score (92.4 SS), improving to 94.6 in 2010. This translated into a reduction in the numbers performing at or below the 10th percentile from 22.0% to 15.9%.

Table 8: Mean Reading Standard Scores at each Class Level in 2007, 2010, 2013, 2016

Grade Level	2007	2010	2013	2016	Norm group average
2nd class	92.4	94.6	97.2	97.6	100
3rd class	90.7	91.6	94.6	95.7	100
5th class	--	93.0	95.6	96.7	100
6th class	90.4	91.2	93.2	94.6	100

Source: Kavanagh et al. (2017)

In 2007, performance was marginally lower at 6th class level (90.4) than at Third class (90.7), and average scores at both class levels improved by about one point by 2010. In 2010, at 6th class, the proportion performing at or below the 10th percentile reduced slightly from 28% to 25.6%.

Between 2010 and 2013, somewhat larger and statistically significant gains were achieved across all class levels (Weir et al., 2017; Weir & Denner, 2013). Thereafter,

[22] This section is abstracted from a longer paper: Shiel, G., French, G., Kennedy, E., & McCormack, M. (2022). *Outcomes of the National Literacy and Numeracy Strategy in Relation to DEIS in early childhood education, primary and post-primary*. Department of Education (Ireland). https://doi.org/10.5281/zenodo.7869158

between 2013 and 2016, the average rate of growth slowed with less than one standard point change (0.4 SS increase in 2nd to 0.8 SS increase in Sixth class), indicating a levelling off of gains (Weir et al., 2017).

Nationally, 10% of children perform at or below the 10th percentile and at or above the 90th percentile. As can be seen in Table 9, for the lowest-achieving children in Third, Fifth and Sixth classes in 2016, the proportions performing at or below the 10th percentile reduced further (14.4%, 12.3%, 17.6%, respectively) while there was a slight increase in Second class (11 to 11.9%). At baseline in 2007, relatively few children in Second, Third and Sixth classes performed at the upper end of the scale (2.2%, 1.6%, 2.3%, respectively). The proportions remained relatively stagnant across Second, Third and Sixth classes with very small increases to 4.2%, 2.1% and 3.9% respectively, in 2016 – still far below the national average of 10%.

Table 9: Percentages of Children at each Class Level Performing at or below the 10th Percentile on Reading in 2007, 2010, 2013, 2016

Class Level	2007	2010	2013	2016	Norm group average
2nd class	22.0	15.9	11.0	11.9	10%
3rd class	26.4	23.0	16.8	14.4	10%
5th class	--	20.6	13.6	12.3	10%
6th class	28.0	25.6	20.2	17.6	10%

Source: Kavanagh et al. (2017)

The DEIS evaluation process also made it possible to track the same children over time and ascertain what growth, if any, had occurred. The standard score (97.9 SS) of the children who were in Second class in 2013, remained the same when those same children were in Fifth class in 2016; a similar result was observed for children in Third in 2013 who were in Sixth in 2016 (95.2 SS).

The DEIS evaluations have also allowed performance comparisons between DEIS Band One and DEIS Band Two schools. As noted earlier, though overall performance shows an upward trajectory at each class level for DEIS schools regardless of level of disadvantage, clear differences in achievement exist between DEIS Band One and Band Two schools. It is notable that, for children in Second and Fifth classes in DEIS Band Two schools in 2016, literacy performance (99 SS) was close to the national norm (100 SS) while it remained significantly below it for children in DEIS Band One schools across each class level. Additionally, for children in Fifth and Sixth classes in DEIS Band One schools, performance in 2016 was below that of

DEIS Band Two children at those class levels in 2007. These findings underscore the complexities involved in changing outcomes for children in DEIS Band One schools.

4.2.3 Mathematics Achievement in DEIS Evaluations

At all class levels, children in urban DEIS schools are performing closer to the national norms in mathematics than they are in reading (Table 10). Average performance at Third and Fifth classes is only 1.5 and 2.0 standard score (SS) points respectively below the national average while it is 4.1 (SS) points below at Sixth class. Improvements across all classes were also seen in the numbers performing at or below the 10th percentile (10% nationally). They more than halved at 6th class level from a high of 31.1% to 14.7%. At the other end of the spectrum, the numbers of children performing at or above the 90th percentile more than doubled at each class level and increased at each round of testing (Table 11). Third and Fifth classes had the highest proportions of children at this level (12.9%, 10.8% respectively) and Second class had the lowest (7.4%).

Table 10: Mean Mathematics Standard Scores at each Class Level in 2007, 2010, 2013, 2016

Class Level	2007	2010	2013	2016	Norm group average
2nd class	91.5	93.9	96.7	97.2	100
3rd class	91.1	92.6	97.2	98.5	100
5th class	--	92.3	95.8	98.0	100
6th class	89.8	91.2	93.6	95.9	100

Source: Kavanagh et al. (2017)

Table 11: Percentages of Children at each Class Level Performing at or above the 90th Percentile in Mathematics in 2007, 2010, 2013, 2016

Class Level	2007	2010	2013	2016	Norm group average
2nd class	2.8	4.5	6.1	7.4	10%
3rd class	5.4	7.3	11.2	12.9	10%
5th class		4.7	8.3	10.8	10%
6th class	4.1	5.5	7.3	9.6	10%

Source: Kavanagh et al. (2017)

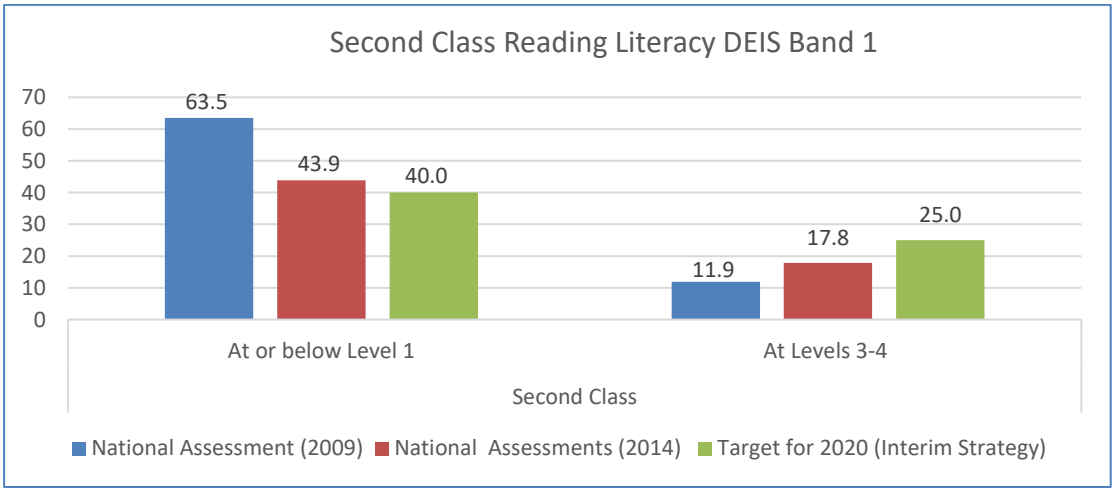
Longitudinal comparisons revealed a mixed picture. Children in Second class in 2013 who were in Fifth class in 2016 demonstrated a small increase in average mathematics achievement scores moving from 96.9 to 98.7. However, for children in Third Class in 2013 there was a small decline in achievement for those same children in 6th class in 2016, reducing from 97.8 to 96.3, a drop of 1.5 SS points.

As was the case in relation to reading achievement, children in DEIS Band Two schools outperformed their peers in Mathematics in DEIS Band One across each class level and at each round of testing. Furthermore, the performance of children in Third and Fifth classes in DEIS Band Two schools exceeded national norms and was approaching norms at Second and Sixth class. Further insights can be gained from the National Assessments of Mathematics and English Reading (NAMER) which overlapped with the DEIS evaluations on two occasions (2009, 2014). NAMER[23] have been conducted at five-yearly intervals since 1972 allowing trends in national achievement to be tracked.

4.2.4 Comparison with the National Assessments of English Reading and Mathematics

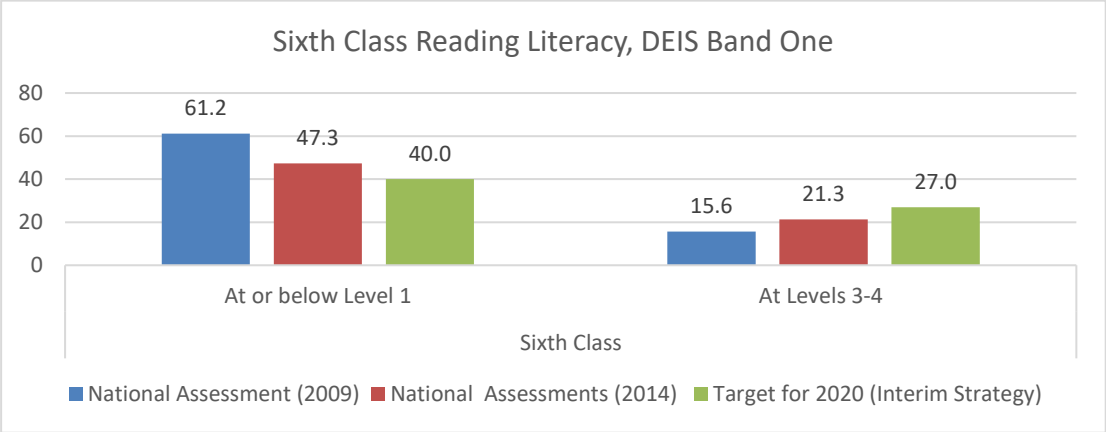
In 2014, each of the achievement targets set in the NLNS strategy (DES, 2011) were met five years early for reading at Second and Sixth class levels and overall national results showed an increase in standards for the first time since 1972.

Figure 5: Percentages of Second Class Pupils Achieving at Various Proficiency Levels on the Reading Scale, NA '09, NA '14, and 2020 Interim Strategy DEIS targets



[23] The format of the test changed in 2009 so direct comparisons with data prior to that are not possible.

Figure 6: Percentages of Sixth Class Pupils Achieving at Various Proficiency Levels on the Reading Scale, NA '09, NA '14, and 2020 Interim DEIS Strategy Targets

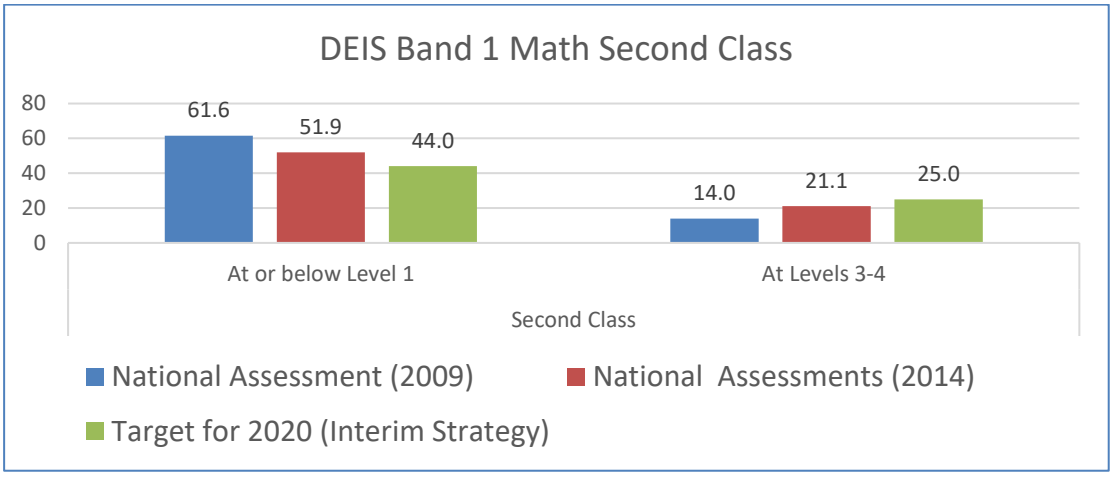


Source: Shiel, Kavanagh & Millar (2014)

Though the national targets were met in 2014, the gap between children in high- and low-SES schools remained. Shiel et al. (2015) concluded 'there has been no real reduction in the gap between pupils in DEIS urban schools and in other school types, except at Second class in Band Two schools'. Significantly, almost twice as many children in 2nd class (43.9%) and 6th class (47.3%) in DEIS Band One schools performed at or below Level 1 in reading compared to peers nationally (21.6%, 24.8% respectively). Additionally, as can be seen in Figures 5 and 6, though achievement in DEIS Band One schools improved substantially between 2009 and 2014, the DEIS targets issued in the 2017 Strategy Review have yet to be met.

In relation to Mathematics, each of the national targets in the NLNS strategy (DES, 2011) were also met. As was the case in reading, the gap between DEIS and non-DEIS remained. In Second class, 51.9% of children in urban DEIS Band One schools performed at or below Level 1 compared to 26.5% in DEIS Band Two schools and just 21.1% in urban non-DEIS schools. Likewise, at Sixth class, 49.9% of children in urban DEIS Band One schools performed at or below Level 1 compared to 41.8% in DEIS Band Two schools and just 24.1% nationally.

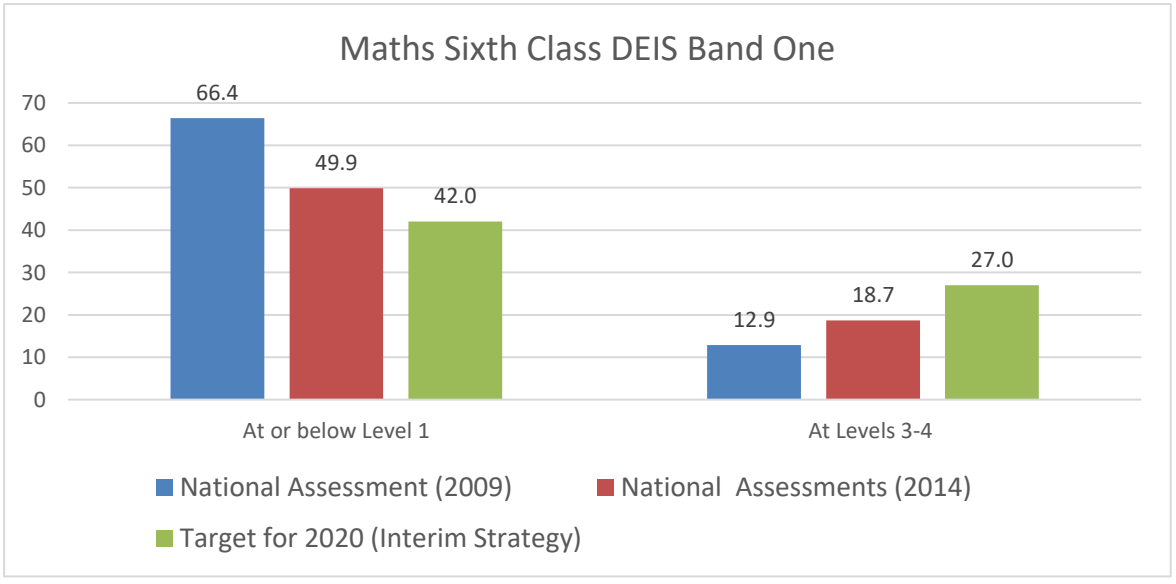
Figure 7: Percentages of Second Class Pupils Achieving at Various Proficiency Levels on the Mathematics Scale, NA '09, NA '14, and 2020 Targets



Source: Shiel, Kavanagh & Millar (2014)

Higher-achievers (those at Level 4 only) on the other hand were under-represented at Second and Sixth classes in both DEIS Band One (2.1%) and DEIS Band Two (10%) when compared to figures for non-DEIS urban (17.3%). Additionally, as can be seen in Figures 7 and 8 indicate that, though achievement in mathematics in DEIS Band One schools had improved (albeit not as strongly as in reading) between 2009 and 2014, the new targets set in the 2017 Interim Strategy Review have yet to be met.

Figure 8: Percentages of Sixth Class Pupils Achieving at Various Proficiency Levels on the Mathematics Scale, NA '09, NA '14, and 2020 Targets



Clearly, though children in DEIS schools have made progress, it is not accelerated enough to narrow the gap, particularly among children in 3rd to 6th classes in DEIS Band One 1 schools as achievement has also risen in non-DEIS schools. The more complex needs, school context and community factors contribute to the challenges. The next section explores differences in achievement between rural and urban DEIS schools in literacy and mathematics.

4.2.5 Comparison of Achievement between Rural and Urban DEIS Schools

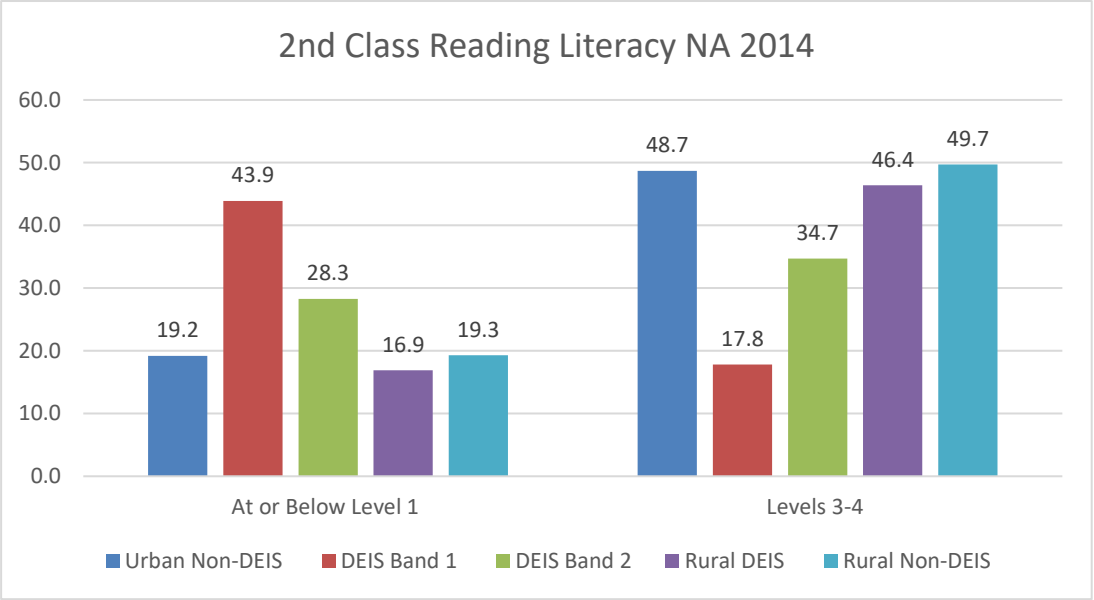
The DEIS evaluation in rural schools involved 238 schools and focused on just two class levels (Third and Sixth classes) between 2007 and 2010 only. Statistically significant increases were found in raw and standard scores for both class levels. Additionally, statistically significant improvements were found in the reduction of children performing at or below the 10th percentile and there was a significant increase in high-performers at 6th class level. Though rural DEIS schools are not divided into Band One and Two, a measure of disadvantage is the holding of a medical card. Further analysis of achievement data was possible for Third classes only as medical card status was not available for Sixth class. Both groups of children showed statistically significant increases in average standard scores in reading from 2007 to 2010 (94.3 to 96.0 (medical card) with non-medical card holders reaching national norms (99.05 to 100.5). Results were less clear cut for mathematics. Non-medical card holders showed a statistically significant increase from a mean of 101.1 to 103.0 while medical card holders showed a non-significant increase (95.8 in 2007 to 97 in 2010). This again illustrates that levels of disadvantage affects achievement and that for the most disadvantaged children, achievement has not increased sufficiently to close the gap.

Further analysis of the differences in reading and mathematics achievement between DEIS and non-DEIS schools in urban and rural settings was completed as part of the national assessments (Shiel et al., 2015). Analysis of data was possible between Urban DEIS Band One, Urban DEIS Band Two, Urban Non-DEIS, Rural DEIS and Rural Non-DEIS.

At Second class the percentage of very low-achievers (below Level One) in rural DEIS increased between 2009 and 2014 (3.9% to 6.1%) (Weir & McAvinue, 2013). Though this is a higher percentage than that found in DEIS Band Two in 2014 (5.1%), it is far lower than DEIS Band One (15.5%). As can be observed in Figure 9, the

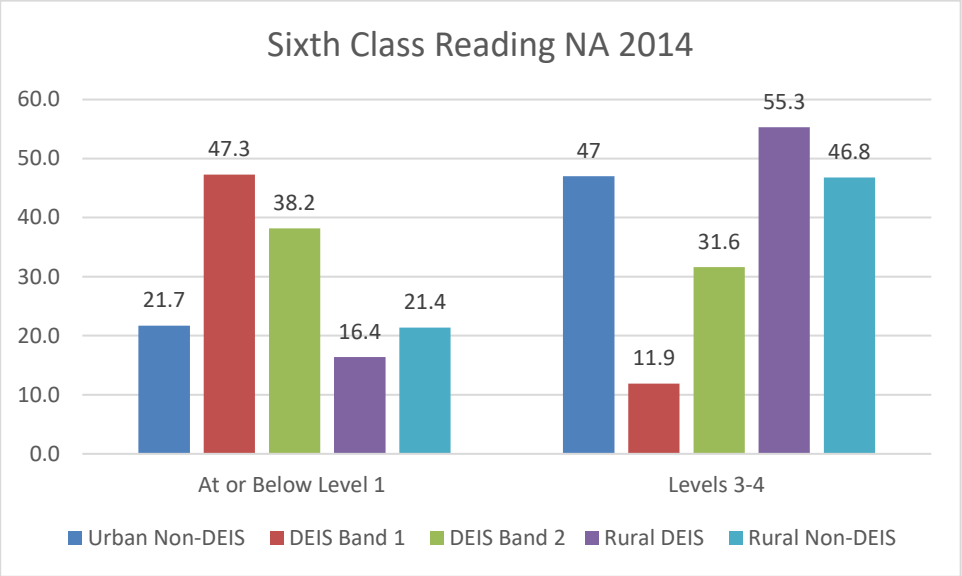
smallest percentage (16.9) of low-performers (Level One and below) was found in rural DEIS and the highest percentage was found in DEIS Urban Band One (43.2).

Figure 9: Percentages of Pupils Performing at Various Proficiency Levels on the Overall Reading Scale, NA 2014 Assessment by DEIS/SSP Status and Year, Second Class



For children in Second class in Urban Non-DEIS and Rural Non-DEIS, performance at levels three and four combined, is similar (48.7%, 49.7% respectively) with rural DEIS not far behind (46.4%). Performance at these levels in DEIS Band One is far below (17.8%) that of the other school contexts. In examining the percentage at the highest level (Level 4), in DEIS Band One there are only 1.5% of children performing at this level, compared to DEIS Band Two (9.5%), Rural DEIS (14.7%), rural non-DEIS (14%) and urban non-DEIS (15.2%) (Shiel et al., 2015).

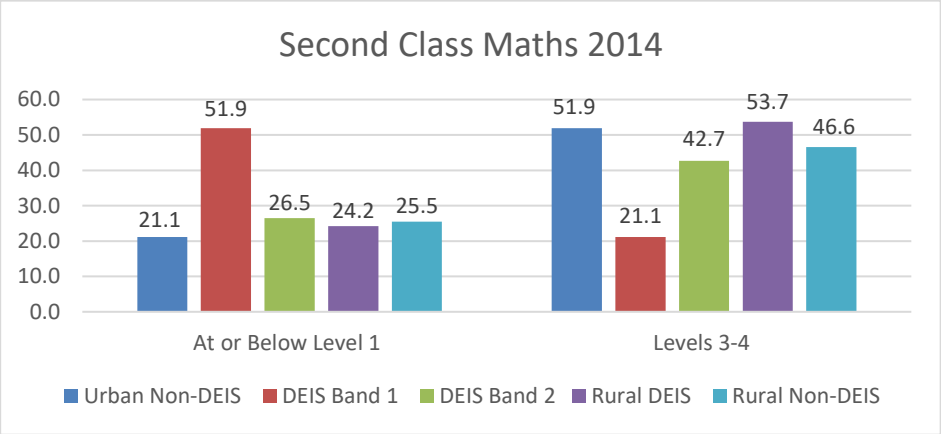
Figure 10: Percentages of Pupils Performing at each Proficiency Level on the Overall Reading Scale, NA 2014 Assessment by DEIS/SSP Status and year, Sixth class



In relation to performance at Sixth class, rural non-DEIS Sixth class pupils (Shiel et al., 2015) had the lowest percentage (16.4) of children performing at or below Level 1 while DEIS Band One had the highest (47.3%). Rural non-DEIS also had the largest percentage of high-achievers performing at Level 4 in reading (17%) (Shiel et al., 2015). This compared to 11.7% in rural DEIS, just 3.4% in Urban DEIS Band One and 15.5% in Urban Non-DEIS. Figures 10 and 11 demonstrate the scale of the gap between DEIS Band One and each of the other school contexts (DEIS Band Two, Urban Non-DEIS, Rural DEIS and Rural Non-DEIS).

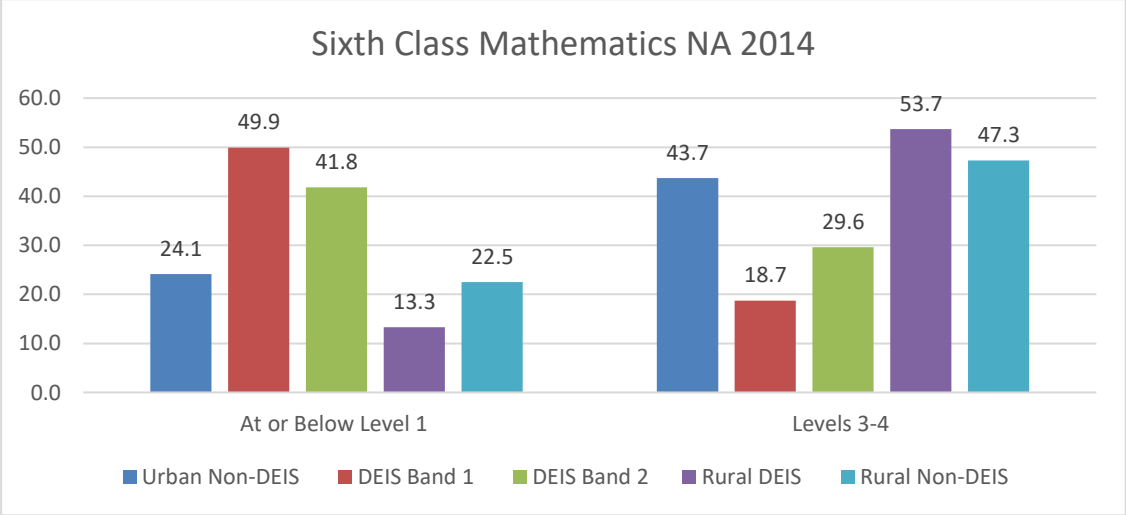
In Second class in 2014, in Mathematics, the lowest percentage (4.6%) of very low-achievers (Below Level 1) was found among rural DEIS pupils in 2014 and the highest percentage was found in Urban DEIS Band One (14.3%). Furthermore, the percentages of children in Second class performing at the highest level (Level 4) were found in urban non-DEIS and rural DEIS (17.3%, 15.6%, respectively). The lowest percentage of high-performers was in DEIS Band One (2.1%) which showed no increase since 2009 (2%) while DEIS Urban Band Two increased from 2% to 9% (Shiel et al., 2015).

Figure 11: Percentages of Pupils Performing at Various Proficiency Levels on the Overall Mathematics scale, NA 2014 Assessment by DEIS/SSP Status and Year, Second Class



Children in Sixth class in rural schools (DEIS and Non-DEIS) outperformed their urban peers at Levels 3 and 4 (53.7% and 47.3%) of children at this level, compared to a low of 18.7% and 29.6% of children in DEIS Band One and Two respectively (Figure 12). Also in 2014, just 2% of children in rural DEIS and rural non-DEIS performed below Level 1 while the percentages for DEIS Band One (11.9%) and DEIS Band Two (12.8%) are much higher (Shiel et al, 2015). Particular care should be exercised in interpreting the percentages in relation to rural DEIS, given that a very small sample was involved in the study.

Figure 12: Percentages of Pupils Performing at Various Proficiency Levels on the Overall Mathematics scale, NA 2014 Assessment by DEIS/SSP Status and Year, Sixth class



Data arising from questionnaires and teacher ratings of pupils' characteristics shed further light on differences in performance between children attending urban and rural schools and are addressed in the next section.

4.2.6 Influence of Affective Dimensions of Learning and Learner Dispositions on Achievement

In attempting to explain the differences in achievement between Rural and Urban DEIS (3rd and Sixth classes), Weir & McAvinue (2013; Weir et al., 2015) drew on three sources of data: (a) pupil questionnaires which explored pupil attitudes, habits, aspirations and behaviour; (b) parental questionnaires which examined home environment factors; and (c) teacher ratings of pupils' behaviour, dispositions and habits. Analysis revealed greater levels of parental engagement in and emphasis on education than typically found in the urban settings. Additionally, children in rural contexts had greater access to educational materials and engaged more frequently in reading outside of school than their urban peers. Furthermore, children in rural disadvantaged schools were less likely to engage in unstructured leisure time activities such as playing with friends or on computers.

Drawing on the *Growing up in Ireland* study, the ESRI review of DEIS research (Smith et al., 2015; McCoy et al., 2014) highlighted other factors which also contribute to the variation in outcomes. Compared to their urban counterparts, students in rural DEIS tend to be more advantaged in terms of social class, education and family structure. Additionally, children in rural DEIS and Non-DEIS nationally have the lowest concentrations of less experienced teachers, a factor which has implications for achievement. McCoy et al. (2014) reported higher reading and maths scores among nine-year olds taught by more experienced teachers.

As well as achievement, the DEIS evaluations explored pupils' (2nd, 3rd, 5th, 6th) attitudes, beliefs, sense of self-efficacy and aspirations for the future. In each of the evaluations (2007, 2010, 2013, 2016) children were asked to what extent they liked school, reading and mathematics. In 2016, children who reported they liked school or liked it a lot had higher mean achievement in both domains than those who reported they disliked school or disliked it a lot.

Differences in mean standard scores increased even further in relation to children's attitudes towards reading and mathematics. Across class levels, children who strongly agreed they liked to solve mathematical problems exceeded national norms and had significantly higher achievement than those who strongly disagreed. This translated into a 15.1 standard score difference at Sixth class, 13.9 (Fifth class) and 8.5 (Third class). Sixth class pupils who strongly agreed they liked reading a lot

(28.7%) had a mean score of 100.5 (reaching national norms), while those who disagreed (18.8%) or strongly disagreed (8.5%) had significantly lower mean scores (90.9, 88.0 respectively). Furthermore, across all class levels, children who reported that they read for fun at home *daily* had higher mean achievement than those who read once or twice a week, once or twice a month or hardly ever or never. In DEIS urban schools, positive dispositions towards reading declined as children progressed through primary with 28.7% of children in Sixth class strongly agreeing they liked to read compared to 47% in Third class.

Frequency of reading is linked to access to books (see Kennedy & Shiel, 2022a; Kennedy, 2018; Allington & McGill-Franzen, 2021). Questionnaires administered as part of the DEIS evaluations to parents of 2nd and 3rd class pupils in 2016 (Kavanagh & Weir, 2018) and findings from the national assessments (Kavanagh et al., 2015; 2017) demonstrate the importance of availability of books in the home with clear associations between the number of books and achievement. The national assessments report about 25% of 2nd class pupils have access to 250+ books in the home. On the opposite end of the spectrum, where parents of children in 2nd and third classes reported no books in the home (3.4%, 3% respectively) children's achievement was well below national norms (90.9, 90.2 SS points). Access to books is also linked to libraries. For the 70+% of parents who reported that at least one person in the family had library membership, children also had higher mean achievement scores than those who did not. Clearly, increasing the frequency and volume of reading within and outside school and ensuring access to books holds promise for addressing underachievement in reading. This has implications for classroom teaching and learning and resources (see Kennedy & Shiel, 2022a).

Internationally, disengagement from academic work has been directly liked to students' experiences of academic tasks and classrooms disconnected from their needs and motivations (Christenson et al., 2013). Nationally, a factor linked to disengagement is the prevalence of ability grouping in disadvantaged schools (Smyth et al., 2015; McGillicuddy & Devine, 2018; Kennedy, 2018). Between-class ability grouping at primary level is more common in DEIS schools (7%) than non-DEIS (4%). Additionally, special classes can be seen as a form of ability grouping and are common in DEIS Band One Schools (24%) and DEIS Band Two (21%) compared to just 5% of rural DEIS and 4% of non-DEIS schools. McGillicuddy and Devine (2018, p.97) have

conceptualised ability grouping ‘as acts of symbolic violence’ in which teachers seeking to manage diverse classrooms, ‘funnel and filter’ children into ability groups which frame and set boundaries for children’s opportunities to learn. Kennedy (2017, 2018) reported improved outcomes in achievement, engagement and self-efficacy for children in DEIS Band One schools working in reciprocal partnership with the Write to Read research project. In this work, a consistent dialogic and relational approach was taken within mixed-ability reading groups in senior classes convened on student choice of book, and an integrated research-informed balanced approach to overall literacy instruction was adopted. The balanced approach, which included attention to oral language, explicit instruction in key literacy skills, and formative assessment and feedback, also impacted positively on children’s writing development (Kennedy & Shiel, 2022b).

The DEIS evaluations also investigated children’s self-perception of their literacy ability when compared to their peers. Poor sense of self-efficacy is linked with poor achievement (Guthrie et al., 2013). It is noteworthy that children who indicated that they were at the bottom of the class (10.1% in 3rd class; 10.8% in 5th; 11.6% in 6th) had the lowest standard scores (87.8 87.7, 86.0 SS points respectively). Children who have a low self-concept are likely to be those confined to low-ability groups and research in the Irish context (McGillicuddy, 2013, cited in Smyth et al., 2015, p.64) confirms that children in such groups at primary level have a *‘poorer self-concept [which] evokes more negative emotional responses such as shame, sadness and upset among children*’.

Clearly, the affective dimensions of literacy and mathematics are as critical as the cognitive dimensions and leveraging student engagement, agency and voice has potential for addressing the achievement gap and in supporting pupils in discovering and achieving their potential (see Kennedy & Shiel, 2022a). The DEIS evaluations considered patterns and trends in achievement at school level as well as pupil level (Kavanagh & Weir, 2018; Kavanagh et al., 2017) and the findings synthesised in the next section draw on these two reports.

4.2.7 School Level Outcomes in Reading and Mathematics

As noted earlier, though overall mean achievement in reading rose on each testing occasion at each class level, there was variation across individual schools. School structural factors such as gender composition and size, and attendance rates

were examined to establish if such factors accounted for school level variations in achievement (Weir & Kavanagh, 2018). Though some gender differences were observed, no clear pattern of change across class levels emerged, e.g., Third and Fifth class pupils in girls' school had higher mean reading achievement than pupils in boys' or mixed schools but there was no difference in mathematics at these class levels. Schools were categorised as small (<190 pupils), medium (190-304 pupils) or large (>305 pupils). Though nationally school size was not a factor in achievement levels, among DEIS schools, pupils in the largest one third of schools had higher mean achievement in both reading and mathematics than those in the smallest third of schools. It should be noted that most of the larger DEIS schools were Band Two rather than Band One.

Schools were classified according to changes in average achievement scores at second, third and sixth classes (e.g., scores increased, decreased or a mixed pattern of change). Only one school had consistent decreases in reading and mathematics at Sixth class level at each time of testing and two schools had consistent decreases in mathematics only at Second and Third class level. About a quarter of schools experienced consistent increases in reading at Second and Third but only 16% occurred at Sixth class levels. For mathematics, the number of schools experiencing consistent increases was much lower (13 in Second; 11 in Third; 16 in Sixth). The more typical pattern in the majority of schools was a mixed pattern from one testing time to the other (2007, 2010, 2013, 2016). Chi-square and t-tests revealed that the structural composition of schools (gender, size) and other factors such as attendance, DEIS status, number of parents holding medical cards, or organisation of learning support within schools were not significantly associated with patterns of achievement over the time period (2007-2016).

Though collected in 2014, two years prior to the 2016 achievement data collection, analysis of questionnaires filled by urban principals (n=221: 131 DEIS Band One), focus group interviews conducted with principals (n=163) and visits to schools with consistent improvements between 2007, 2010, and 2013 (n=20), provide further insights to shape our understanding of factors influencing the variations in school level achievement. The sample for this data was wider than the 120 schools who contributed test data on each of the three testing periods. It provided opportunities for principals of schools not evaluated in the testing to provide their views on the DEIS strategy to date.

Principals reported that gains were most evident in junior classes (89% in relation to reading; 82% in relation to mathematics). Additionally, 51.4% indicated that lowest-achieving pupils had benefited the most in reading while for mathematics it was more evenly spread between low-achievers (39.8%) and middle-achievers (32.4%). High-achievers in both domains were least likely to have benefited (2.8% of principals in relation to reading; 11.1% in relation to mathematics). Principals whose schools experienced gains were also asked to rank in order of significance (first, second, third) from a list of factors, the ones they considered most influential in bringing about the improved outcomes. The top three factors highlighted were specialised literacy and numeracy programmes introduced under DEIS, target setting in both domains and reduced class size. Other factors which principals also highlighted as important included children's enhanced motivation and engagement, better attendance rates, improved learning support services and provision of professional development for teachers.

In focus group interviews, the principals of DEIS Band Two schools drew attention to the lower pupil teacher ratios in DEIS Band One and urged the extension of lower class sizes to all DEIS schools and in particular to senior classes if the gains made in junior classes were to be maintained. Some principals also cited serious behaviour issues and high levels of 'severe emotional difficulties' (Kavanagh et al., 2017, p. 53) as factors affecting progress. Some noted that the increasing complexity of reading and higher-order comprehension skills were challenging to develop in upper primary without greater levels of engagement in reading outside school. Overall, principals expressed the view that it was the combination of the range of supports available to DEIS schools that had contributed to improved outcomes rather than any one single factor and they argued that continued professional development for teachers was critical to success and should be maintained going forward.

4.2.8 Conclusion

The DEIS evaluations reveal that children in DEIS primary schools have made progress. However, it has not been accelerated enough to narrow the achievement gap, particularly among children in 3rd to 6th classes in DEIS Band One 1 schools, as achievement has also risen in non-DEIS schools. It is also clear that a range of factors are at work in bringing about an improvement in outcomes and the more complex

needs, school context and community factors in urban DEIS contribute to the challenges in closing the gaps.

While the DEIS evaluations provide valuable insights and a picture of trends and patterns in reading achievement over time, they do not measure other key dimensions of literacy such as oral language or writing. The latter is assessed in England, US and Australia as part of their national assessments. In addition, the reading measures utilised are vocabulary based and as such are a proxy for reading comprehension. More nuanced reading assessments and a broadening of assessment to include other dimensions of literacy would give a more complete picture of achievement. Similarly, in relation to mathematics, as a shortened version of the DPMT-R test was given, there were too few items for each content area or process to draw firm conclusions on particular aspects of mathematics. Future assessments should broaden in focus.

DEIS evaluations also cannot provide insights into the day-to-day workings of classrooms, the shape of literacy instruction in individual classrooms and how it changes and is adapted across class levels. Given the variation in outcomes for DEIS schools, the ESRI (Smyth et al.,2015, p.ix) have called for case-study research that *'could provide insights into which school and teacher factors influence such variation'.* Such case studies are currently under construction in the Irish context (Ng & Kennedy, in press; Kennedy & Shiel, in press). Case study research can provide rich and thick descriptions of practice useful for the system. Such information would enable policy makers to identify critical enabling and constraining school and classroom factors impacting on progress and as such, should be a priority for further research going forward.

As has been reported in the DEIS evaluations, there are substantial differences in achievement between children who report they like to read and those who dislike it. The affective dimensions of literacy and mathematics are as critical as the cognitive dimensions, and leveraging student engagement, agency and voice has potential for addressing the achievement gap and in supporting pupils in discovering and achieving their potential (see Shiel, French, Kennedy & McCormack, 2022; Kennedy & Shiel, 2022). These influencing factors on achievement need greater attention going forward.

Additionally, given the extent of the achievement gaps between DEIS Band One urban schools and non-DEIS urban schools, a more intensive and concentrated

approach should be considered. Such an approach would include more sustained customised school-based professional development on literacy and numeracy pedagogies, greater use of formative assessment and feedback to target teaching specific to children's identified needs, whole school approaches to literacy and numeracy to ensure overall progression and growth from year to year, and a more concerted effort to foster engagement in and enjoyment of reading and writing and confidence with numeracy.

A4.3 Impact of DEIS at Post-Primary Level on Literacy and Numeracy

This section summarises research that has examined the impact of DEIS at post-primary level. It looks at performance on international assessments on reading literacy and mathematics, performance on the Junior Certificate (now the Junior Cycle) examination, and retention rates up to Leaving Certificate level.

4.3.1 Performance on PISA Reading Literacy

One source of information on the performance of students in DEIS post-primary schools on reading literacy and mathematics (called mathematical literacy by the OECD) is their performance on the OECD PISA Assessment, which is administered to representative national samples of 15-year-olds in almost 80 countries. The last PISA cycle for which results are currently available was PISA 2018. The next cycle is scheduled for 2022, with results available in 2023.

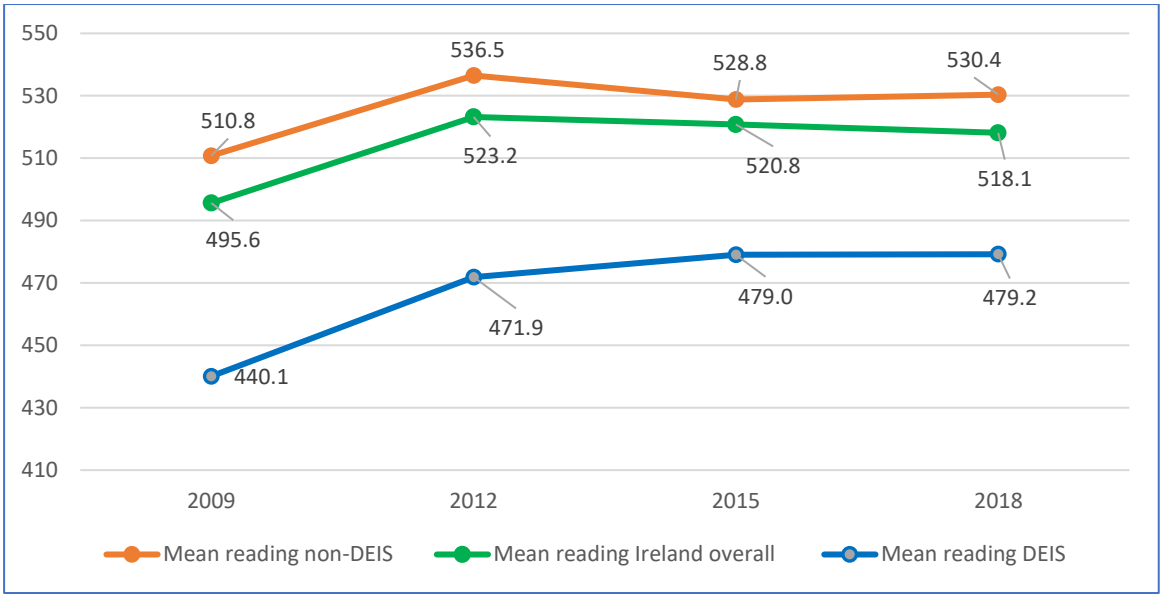
Some caution should be exercised in using the outcomes of PISA to gauge the performance of students in DEIS (and non-DEIS schools). In particular, the mean score for Ireland on PISA 2009 reading literacy was 495.6[24], which was not significantly different from the OECD average in that year. This represented a large decline, compared with previous and future cycles. Hence, any improvement since 2009 must be treated with caution (Ireland's overall mean score on reading literacy in PISA 2018 was 518.1, a score that was significantly above the OECD average.

Figure 13 shows mean scores on PISA reading literacy for students in DEIS, non-DEIS and all schools in the period 2009-2018. While performance among students in

[24] When PISA is a major assessment domain for the first time, the OECD mean is set to 500, and the standard deviation to 100. Reading literacy was a major assessment domain for the first time in 2000 (the first cycle of PISA), while mathematics was a major assessment domain for the first time in PISA 2003. PISA 2009 is selected as the reference year here, since 2009 was the first year in which reading literacy was a major assessment domain, following implementation of DEIS (from 2006 onwards).

DEIS schools has improved since 2009, when the mean score was 440.1, it has remained in a narrow range between 2012 (471.9) and 2018 (479.2). Moreover, as noted by Gilleece et al. (2020), the mean score of students in DEIS schools in 2018 is not significantly different from the average across all OECD countries in the same year (487.1).

Figure 13: Mean Scores of Students on PISA Reading Literacy, Overall and by School, DEIS Status, 2009 to 2018



Source: Gilleece et al. (2020), Table 3.2.

Although targets for overall performance on PISA reading literacy were included in the Literacy and Numeracy Strategy in 2011, targets for DEIS schools were not set until publication of the Interim Review of the Strategy in 2017,[25] when a target of 18% was set for 2020 for students performing below proficiency Level 2 on the PISA scale (low-achieving students), 26% for those performing at Level 4 or higher, and 8% for those performing at Level 5 or higher (high-achieving students) (Table 12). According to Gilleece et al. (2020), the target of 18% for below Level 2 was probably achieved (18% was in the 95% confidence interval around the reported percentage of 21.8%). However, the targets for Level 4 and above, and for Level 5 and above had not been achieved. Although the target for low-achievers was likely to have been achieved, it is of concern that almost one-quarter (23.9%) of male students and almost one-fifth of

[25] Due to an error in the PISA 2015 baseline data for DEIS schools, which overestimated the baseline level of achievement, incorrect baseline information and associated targets were published in the Interim Review. Corrected targets, which were generated by Gilleece et al. (2020, p. 13), are included in the current report.

female students (18.9%) performed below Level 2 in 2018 (comparable figures for non-DEIS schools are 11.7% for males, and 5.9% for females).

Table 12: Targets for 2020 for Percentages of Students in DEIS Schools with PISA Reading Achievement Below Level 2, At or Above Level 4, and At or Above Level 5

PISA Proficiency Level	Baseline PISA 2015 – DEIS Schools	Target for 2020	PISA 2018 – DEIS Schools (95% CI)	Target Likely to be Met?
Below Level 2	21.8%	18%	21.8% [17.8, 25.8]	Probably
At or above Level 4	21.4%	26%	21.2% [17.6, 24.9]	Unlikely
At or above Level 5	4.7%	8%	5.5% [3.9, 7.0]	Unlikely

Source: Gilleece et al. (2020), Table 3.2.

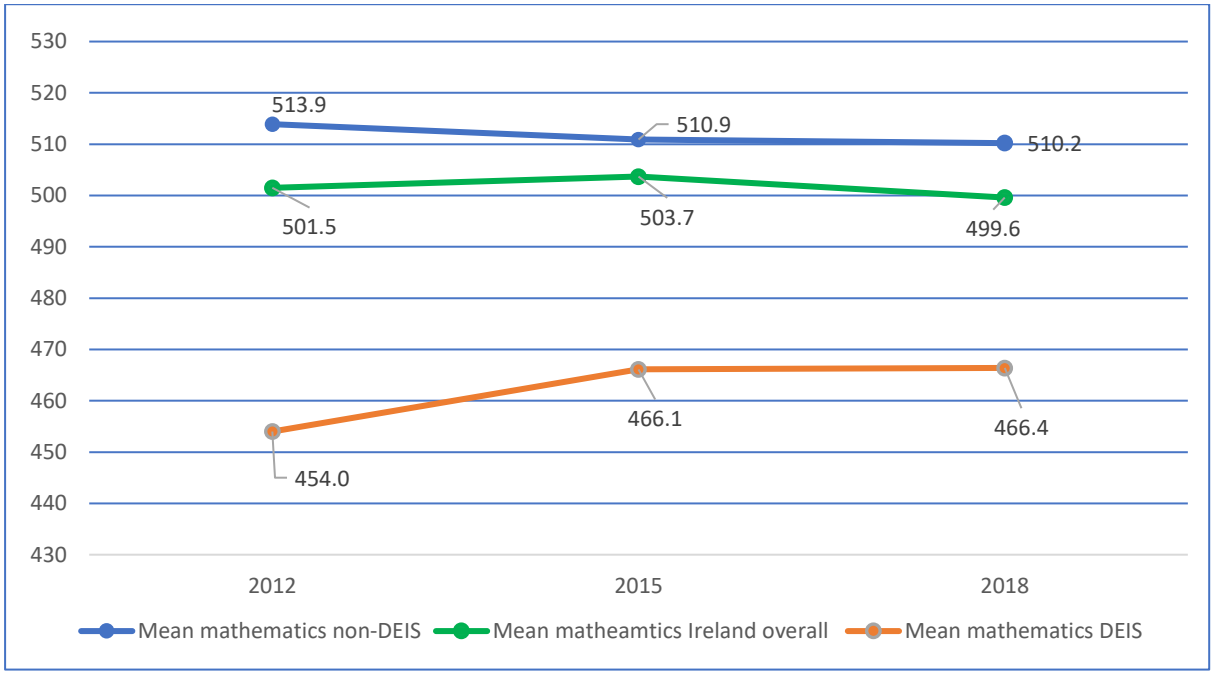
Evidence of low engagement in reading is also found in the proportion of students in DEIS schools in PISA 2018 who reported that they did not read at all for enjoyment (58.5%), which is significantly lower than the proportion in non-DEIS schools (44.3%) (McKeown et al., 2019). In DEIS schools, 66.0% of males and 48.4% of females reported that they did not read at all for enjoyment, compared with 52.1% and 37.4% (respectively) in non-DEIS schools.

4.3.2 Performance on PISA Mathematics

PISA also provides information on the performance of students in DEIS and non-DEIS schools on mathematical literacy (mathematics). While average performance nationally was unexpectedly low on PISA mathematics in 2009 compared to earlier and subsequent cycles, the decline in that year was smaller than for reading literacy. Figure 14 shows the mean scores from 2012 (when mathematics was a major assessment domain in PISA for the first time since the implementation of DEIS) to 2018. Students in DEIS schools achieved a lower mean score in PISA 2018 mathematics (466.4) than students in non-DEIS schools (501.2). Whereas in the case of reading literacy, the mean score of students in DEIS schools did not differ from the OECD average, performance on mathematics among students in DEIS schools is significantly lower than the corresponding OECD average (489.3). This indicates greater underachievement in mathematics among students in DEIS schools, relative to underachievement in English. Conversely, it suggests that, if performance nationally

were as high in mathematics as it is in reading literacy, students in DEIS schools might perform closer to the OECD average.

Figure 14: Mean Scores of Students on PISA Mathematics, Overall and by School, DEIS status, 2012 to 2018



Gilleece et al. (2020) noted some evidence of progress among students in DEIS schools on PISA mathematics between 2012 and 2018. Whereas 37.4% of students in DEIS schools performed at or below Level 2 on PISA 2012, significantly fewer did so in 2015 (29.0%) and in 2018 (28.1%). There was no significant difference between 2012 and 2018 in the proportions of non-DEIS students performing at those levels (11.5%, 12.3% and 11.8% respectively).

As with reading literacy, the Interim Strategy Review provided targets to be reached by 2020 for the proportions of students in DEIS schools performing below Level 2 (low achievers), at or above Level 4, and at or above Level 5 (high achievers). According to Gilleece et al., it was unlikely that the target of 23% for below Level 2 would be achieved because the target value was not contained in the 95% confidence level around the 2018 value of 28.1% (i.e., between 23.1 and 33.0) (Table 13). However, they note that the target of 23% is close to the lower bound of the interval (23.1%). Hence, the rating of 'possible'. The other targets were deemed unlikely to be achieved. In the case of Level 5 or above, for example, the target is 9%, but this is outside the 95% confidence interval of [2.1, 5.8] around the 2018 value of 3.6%.

Table 13: Targets for 2020 for Percentages of Students in DEIS Schools with PISA Mathematics Achievement Below Level 2, At or Above Level 3, and At or Above Level 5

PISA Proficiency Level	Baseline PISA 2015 – DEIS Schools	Target for 2020	PISA 2018 – DEIS Schools (95% CI)	Target Likely to be Met?
Below Level 2	29.0%	23%	28.1% [23.1, 33.0]	Possible
At or above Level 4	16.1%	22%	15.8% [12.8, 18.8]	Unlikely
At or above Level 5	4.7%	9%	3.6 % [2.1, 5.0]	Unlikely

Source: Gilleece et al. (2020), Table 4.2

Among students in DEIS schools, 26.9% of males and 29.8% of females performed at or below Level 2 in PISA 2018 mathematics. These estimates are 2.5 times higher than for non-DEIS schools (11.3% and 12.1% respectively), indicating higher levels of underachievement in DEIS schools. The percentages of high-achieving males (4.5%) and females (2.2%) in mathematics in DEIS schools (those at Level 5 or higher) are also significantly lower than in non-DEIS schools (7.7% and 12.0% respectively) (Gilleece et al., 2020).

4.3.3 Wellbeing Indicators in PISA

Nelis et al. (2021) drew on PISA questionnaire data to examine differences between students in DEIS and non-DEIS schools on a range of well-being variables. Parents of students in DEIS schools had a significantly higher mean score on an index of school policies for parental involvement, indicating that parents in DEIS schools held more positive perceptions of home-school communication, parental involvement opportunities, and the provision of parent education and supports. Furthermore, there was no significant difference between DEIS and non-DEIS schools on the PISA index of parents' emotional support, with positive values on the index in both contexts reflective of high levels of emotional support by parents in Ireland. There were no differences between the mean scores of students in DEIS and non-DEIS schools either on wellbeing indicators such as overall meaning of life, positive feelings, and self-beliefs about resilience. Furthermore, no significant differences were noted in bullying between the two school types.

Among the challenges for DEIS schools identified by Nelis et al. (2021) were greater proportions with special education needs (23% in DEIS schools, according to

school principals) compared with 17% in non-DEIS schools), greater proportions with a first language other than English or Irish (15% vs. 11%), and greater proportions from disadvantaged homes (59% vs. 22%). A large minority of students in DEIS schools reported frequent disruption in English classes associated with student inattention. Nelis et al. interpreted this as a need for support for teachers in developing classroom management skills, in the context of professional development.

4.3.4 Performance on State Examinations

The Educational Research Centre issued a series of reports that have looked at performance on the Junior Certificate examination, retention rates to Junior and Leaving Certificate levels, and the effects of disadvantage on student performance over time. The most recent report (Weir & Kavanagh, 2018) looked at examination results in the period 2007 to 2016. Using a measure that combines scores across subjects (the 'OPS' or overall performance scale), an increase in performance was noticeably greater for DEIS schools than for non-DEIS schools. Whereas the average OPS annual increase for schools in general was 0.24 OPS points between 2007 and 2016, it was 0.19 points for non-DEIS schools, and a significantly higher 0.33 points for DEIS schools. This can be interpreted as indicating a greater level of improvement among students in DEIS schools. Weir and Kavanagh also observed a narrowing of the achievement gap among students in DEIS and non-DEIS schools on English and Mathematics. Progress in DEIS schools was also evident in fewer students taking examinations at Foundation level, and more at Higher level. For example, between 2007 and 2016, the proportion taking Higher level mathematics increased by about the same amount in DEIS schools (13.4%) and in non-DEIS schools (13.3%).

In 2007, the gender gap in favour of females in non-DEIS schools on the Junior Certificate OPS scale was 2.3 score points, while it was 2.6 points in DEIS schools. In 2016, the gender gap was 2.5 OPS points in both school types, indicating a slight narrowing in DEIS schools, and a small increase in non-DEIS schools. Weir and Kavanagh note that, although the improvements that they documented cannot be attributed directly to the implementation of DEIS, it is likely that DEIS played a role.

4.3.5 Retention Rates

Weir and Kavanagh (2018) also examined the impact of DEIS on retention at Junior and Senior Cycles in post-primary schools. In this instance, a student is deemed to have been retained if they sat the Junior Certificate (now Junior Cycle) examination,

and/or the Leaving Certificate examination. At Junior Certificate level, DEIS schools showed a significantly higher rate of change in retention rates between 1995 and 2011 (0.43 percentage points per year) compared with non-DEIS schools (0.17), though this needs to be interpreted in the context of a very high baseline in non-DEIS schools in 1995 (96%), compared with DEIS schools (88%).

Post-primary schools have also seen retention rates to Leaving Certificate improve since the introduction of DEIS – from 80.1% for the 2006 entry cohort to 84.8% for the 2014 entry cohort. The gap in retention rates between DEIS and non-DEIS schools has narrowed from a gap of 16.8% for the 2001 entry cohort to approx. 8.6% for the 2014 cohort (DES, 2021). The comparable results for the 2013 cohort were 83.8% for DEIS and 93.1% for non-DEIS, with a gap of 9.3 percentage points (DES, 2020).

The DEIS Plan (DES, 2017) has set a target of 90.2% for retention of students in second-level DEIS schools by 2025. It suggests that, in the interim, DEIS schools should set achievable targets in relation to retention, when reviewing their school plans.

A4.4 Conclusion

The outcomes for students in DEIS schools on reading literacy, as measured by the PISA assessment, are generally positive, notwithstanding a temporary decline in standards across all schools, including DEIS schools, in PISA 2009. It is encouraging that there were small (though not significant) increases in the mean scores of students in DEIS schools in Ireland in 2015 and 2018, indicating a successful transition to computer-based texts, especially in 2018, when reading literacy was a major assessment domain in PISA. While overall performance on PISA reading literacy among students in DEIS schools improved between 2009 and 2012, it has remained stable since then.

The targets for reading literacy in DEIS schools, established in the Interim Review of the Literacy and Numeracy Strategy in 2018, to be achieved by 2020, have been partially achieved. When the 95% confidence interval around the proportion achieving below Level 2 in 2018 is taken into account, the target of 18% at or below Level 2 by 2020 have been achieved. However, the targets for two other overlapping groups, those at or above Level 4, and those at or above Level 5 have not yet been achieved.

However, it is a matter of concern that almost one-quarter of male students (23.9%) as well as almost one-fifth of female students (18.9%) performed below Level 2 in PISA 2018, and that relatively few male students (5.4%) and female students (5.5%) performed at or above Level 5.

One factor that may be associated with the (still) relatively large proportion of students performing below Level 2 may be the low level of engagement by students in reading for enjoyment. In 2018, 66.0% of male students and 48.4% of females reported that they did not read for enjoyment at all.

The situation with regard to PISA mathematics in DEIS schools is less promising. The mean score of students in DEIS schools in PISA 2018 was 466.4, which was significantly lower than the corresponding OECD average (489.3), though the gap between students in DEIS and non-DEIS schools for mathematics in 2018 (34.8) is lower than for reading literacy (51.2 score points). This partly reflects lower performance in Ireland more generally on mathematics compared with reading literacy.

The situation with regard to the targets for mathematics in the 2018 Interim Review is similar to that of reading, with the target for Below Level 2 (23%) likely to have been achieved, and the targets for Level 4 and above, and for Level 5 and above, not yet achieved. Also of concern is that, among male students in DEIS schools in 2018, 26.9% performed below Level 2, while 29.8% of females did so in the same year.

While some improvement in mathematics performance may be achieved by focusing more strongly on lower-achieving students, it is also clear that recent initiatives designed to improve performance in all schools have not had a very strong effect. For example, mean scores on PISA mathematics following the implementation of Project Maths in all schools in 2010 have remained more-or-less stable through 2018. What seems to be needed is a stronger focus on developing mathematical proficiency across all schools, though this may now be even more challenging if performance levels have dropped further, arising from school closures during COVID-19.

Other indicators of progress in literacy and numeracy among students in DEIS schools are positive, though it is not always possible to attribute these directly to implementation of DEIS and its component programmes. There has been a greater increase in overall performance of students in DEIS schools on the Junior Certificate

(now the Junior Cycle) examination over the years 2002-2017, compared with students in non-DEIS schools (albeit from a lower base). Performance on English and mathematics has also improved at a faster rate, with more students in DEIS schools taking Higher level English and mathematics, and fewer taking the now defunct Foundation level in these subjects. There has also been greater retention of students in DEIS schools to the Junior Certificate and Leaving Certificate examinations.

Of necessity, this short commentary has only looked at a selection of variables associated with the development of literacy and numeracy among students in DEIS post-primary schools. Readers are referred to the paper by Kennedy and Shiel (2022) on international research on reducing achievement gaps between disadvantaged and non-disadvantaged students in primary and post-primary levels, and to national reports by Nelis et al. (2021) and Smyth et al. (2015)

A5. Curriculum Development Linked to the National Literacy and Numeracy Strategy

There have been many developments in language curricula since the publication of the Literacy and Numeracy Strategy (Department of Education and Skills, 2011). In the context of ECEC, previously mentioned in A2 above – Situating the NLNS in the Broader Policy Context – *Aistear the Early Childhood Curriculum Framework* is being updated through a commissioned literature review and consultation with children and with wider stakeholder engagement (NCCA, 2009). It is anticipated that this review will strengthen and update Aistear, as there has been considerable change in the context of ECEC since its original publication in 2009. The National Síolta Aistear Initiative (NSAI) was established in 2016 to support the coordinated roll-out of *Síolta* and *Aistear*. The Initiative arose in response to findings from a survey in 2015, which identified a gap in knowledge and skills among ECEC educators in how to support the educational development of children in ECEC (DES, 2018). The DE is leading the initiative in collaboration with the DCEDIY (who fund the Initiative), Better Start and the NCCA. The Initiative brings together all State supports for *Aistear* and *Síolta* and includes mentoring and continued professional development and learning. Practical supports were developed and provided in the Aistear Toolkit and the Aistear Síolta Practice Guide. The further rollout of the NSAI is a welcome development as proposed in First 5 (GoI, 2019). There is a commitment to ensuring that the redeveloped Primary School Curriculum reflects more fully the principles underpinning *Aistear* and is also

acknowledged in First 5 (GoI, 2019), ensuring continuity between the provision of ECEC and the early years of primary school.

As reported in the Interim Review (Department of Education and Skills, 2017) provision was made for more time to be spent on literacy and numeracy in primary schools. It was also intended that there would be a greater emphasis on the development of literacy and numeracy in all curricular areas. The NCCA prioritised the curriculum for language in 2010 and commissioned three research reports to inform the development of the language curriculum in primary schools. Three reports were published in 2012 (Kennedy et al., 2012; Ó Duibhir & Cummins, 2012; Shiel et al., 2012) examining the areas of oral language, literacy and the concept of an integrated language curriculum. These reports underpinned the new primary language curriculum (PLC) which was introduced for infants to second class in September 2016. This was followed by an integrated language curriculum for all classes in primary school in 2019 (Department of Education and Skills, 2019). There are separate curriculum documents for English-medium and Irish-medium schools. The PLC presents language learning to children in an integrated way where learners can transfer linguistic skills across languages particularly in the area of literacy. This facilitates greater efficiency in language learning recognising that children come from a variety of linguistic backgrounds and learn English and Irish in both English and Irish-medium contexts. The home language of children who speak a language other than English or Irish at home is seen as a resource rather than a deficit. The NCCA (n.d.) developed a suite of support materials for teachers to aid them in the implementation of aspects of the curriculum that were new. Professional development support has been provided by the PDST since 2020 and continues with online webinars and support materials for teachers in implementing the language curriculum in the form of a manual based on six key components of effective literacy teaching and learning (PDST, 2020). NEPS (2016) developed a resource for teachers, *A Balanced Approach to Literacy Development in the Early Years*, which is available in English and Irish.

The NCCA is currently reviewing the structure of the primary curriculum and the time allocation for all subject areas including language (NCCA, 2020). The *Draft Primary Curriculum Framework* was open to public consultation until the end of February 2022. There are three proposals in relation to time allocation. In the case of language, the monthly allocation would be 23 hours in Infant classes and 31 hours

from 2nd to 6th classes. All options allow for the introduction of a third language for one hour per week from 3rd to 6th class. This hour per week would come from the overall time allocation to language.

At Junior Cycle level, being literate and numerate were identified as key skills in the Framework for Junior cycle 2015 (Department of Education and Skills, 2015). These skills are to be developed across all subject areas and promote the development of literacy and numeracy skills in a cross-curricular manner. A new English specification was introduced in 2014 which builds on the development of students' oral and literacy skills achieved at primary level. This specification envisaged an increase in the use of digital texts which should further enhance students' digital literacy skills. The inclusion of Being Literate as a key skill to be developed across learning in all subjects at junior cycle will also promote the cross-curricular development of literacy skills. As with other subject areas the assessment of English has changed with the inclusion of two classroom-based assessments with a final examination organised by the State Examinations Commission. Separate specifications for first and second language school contexts were introduced for Gaeilge in 2017 and will be subject to an early enactment review in 2022. The L1 specification allows for more challenging cognitive and higher-order thinking skills development in Irish for Irish-medium students. This should result in higher literacy achievement among L1 students. The NCCA has also developed Level 2 Learning Programmes in communication (Literacy and Numeracy) for students with low, mild or moderate general learning difficulties.

At Senior Cycle level, while literacy and numeracy are not identified as key skills, the skills identified support the development and enhancement of literacy and numeracy, the skill of communication in particular. The NCCA is conducting a review of Senior Cycle and published a *Draft Public Consultation Report* in December 2019. The final step of this process is to present an advisory report to the Minister for Education. In relation to Gaeilge, the NCCA published two draft specifications for Leaving Certificate Irish L1 and L2. This approach builds on that of Junior Cycle facilitating greater cognitive challenge for L1 students of Irish and consequent higher achievement levels in Irish literacy. A consultation process on the draft specifications closed on 30 November 2021 and generated a large number of submissions and questionnaire responses. The NCCA gathered feedback and opinions through online surveys, focus

groups, bi-lateral meetings and written submissions. A consultation report is expected in 2022. The Department of Education's policy in relation to modern foreign languages was set out in *Languages Connect, the Foreign Languages Strategy 2017 – 2026*. New Leaving Certificate specifications are available for Lithuanian, Polish, Portuguese and Mandarin Chinese.

A notable feature of the curriculum developments in the area of language has been a move towards a more multilingual approach where the linguistic repertoire of all learners is receiving greater recognition. The Primary Language Curriculum promotes the transfer of skills across languages and the transfer of literacy skills is particularly strong. The proposed introduction of a modern foreign language from 3rd class in primary schools would facilitate the transfer of these skills to other languages. The needs of Irish-medium students were recognised in the Primary School Curriculum of 1999 (Department of Education and Science, 1999) and further developed in the current Primary Language Curriculum. This has led to more ambitious literacy learning outcomes for those students. This approach is being continued at post-primary level. The introduction of new specifications in Lithuanian, Polish, Portuguese and Mandarin Chinese recognises the home languages of those learners just as greater value is being placed on students' home languages in primary school. An overarching school language policy could bring greater coherence to language teaching and consequent literacy development embracing a multilingual approach with alignment to the Common European Framework of Reference for Languages (Council of Europe, 2001, 2018).

The redevelopment of the Primary Mathematics Curriculum Specification (PMC) followed on from progress with the PLC and has had quite an extended time frame spanning from initial conception to the launch of the complete draft specification in April 2022. Shaping curriculum developments were two commissioned reports on mathematics education in the age range of 3 to 8 years, focusing on Definitions, Theories, Development and Progression (Research Report 17) (Dunphy et al., 2014) and on Teaching and Learning (Research Report 18) (Dooley at al., 2014), as well as an international audit of mathematics curricula (Burke, 2014). Perspectives of teachers and principals were also garnered through focus groups interviews. Together, these informed a background paper and brief for development of the new PMC with a draft specification for Junior Infants to Second Class made available for consultation the following year (NCCA, 2017). In the second phase of developments, further research

was added to the existing complement, including an addendum to NCCA Research Reports 17 and 18 (Dooley, 2019); and a suite of short research papers on teaching and learning mathematics in the senior classes of primary schools (Delaney, 2020; Leavy, 2020; Nic Mhuirí, 2020a, 2020b; Twohill, 2020).

The central tenet of the PMC is that *all* children are capable of "Being Mathematical" (NCCA, 2021, p.10). Thus, in order to support the development of mathematical proficiency (NCCA, 2022, p.11), the PMC identifies five key pedagogical practices; the use of cognitively challenging tasks, promoting maths talk, fostering productive disposition, using formative assessment, and emphasising mathematical modelling; that underpin the central work of the teacher in enacting and realising the aims of the curriculum (NCCA, 2022, p.25). Whilst the particular content strands of the PMC have not deviated from the 1999 curriculum, what is noteworthy is the reordering of the strands so that Number holds a less prominent position. Moreover, there has been a shift in presentation away from content objectives to that of learning outcomes.

Situated within the draft toolkit that accompanies the PMC are mathematical concepts that underpin each learning outcome and progression continua which identify key milestones in learning. Clarke et al. (2002) describe these stages as "stepping stones" along paths to mathematical understanding. Whilst acknowledging that progress is not always linear and that children may be in transition between two points, this approach captures and communicates patterns of learning as students move from naive to sophisticated thinking (Confrey, 2019). The use of a progression continua approach is advocated in many successful approaches to developing innovative mathematics curricula internationally (Clements & Sarama, 2004) and more recently nationally with the launch of the PLC. This approach helps teachers to build mathematics learning environments that are developmentally appropriate and effective (Sarama & Clements, 2009; Clements & Sarama, 2014); assists teachers in planning instruction and guides the selection of classroom tasks and activities (Confrey, 2019); supports teachers in identifying, analysing and accommodating multiple levels of thinking within the classroom (Wickstrom, 2012) and enables a connected pedagogical approach across class levels (Wickstrom, 2012). Moreover, the use of progression continua from an assessment perspective supports teachers in interpreting evidence and making informed judgments about children's understanding of key concepts and practices (Confrey, 2019); provides a specific set of expectations about children's

learning in relation to a specific topic and their likely pace along a learning path (Clements et al., 2011); and can be utilised by students to monitor and evaluate their own progress (Heritage, 2008).

Children's views are seen as an essential part of any consultation on curriculum implementation (NCCA, 2005). Thus, the NCCA are welcoming feedback on the draft PMC and toolkit from all interested parties and stakeholders through the use of two online questionnaires and a written submission facility and are also capturing the voice of children from the network of 15 schools who volunteered to participate in the pilot. This is important so as to understand, holistically, the opportunities and challenges presented in any curriculum reform. It is anticipated that the next stage will be to explore the possible links between mathematics, science and technology.

At post-primary level, there have been significant curriculum developments in mathematics over the past two decades. After a review of post-primary mathematics in 2005, the NCCA began the phased introduction of 'Project Maths' in 2010. This was a revised mathematics curriculum that gave students and teachers opportunities to explore connections, and where mathematics was seen as a 'network of ideas that teachers and students construct together' (NCCA, 2012). The curriculum called for more 'student sense-making, problem solving, engagement in rich learning activities, and conceptual understanding to accompany procedural skill' (NCCA 2012, p. 9). A 2017 report evaluating the impact of project maths at Junior Cycle indicated that overall, the Project Maths curriculum has had a small positive effect on students' performance in Mathematics, and that it has significant impact on teaching approaches in mathematics (Shiel & Kelleher, 2017).

Following the introduction of the Junior Cycle Framework (DES, 2015), a revised Junior Cycle mathematics specification was introduced for all first-year students in Autumn 2018. This specification aligned with the Junior Cycle Framework. The specification is underpinned by "the conception of mathematics as an interconnected body of ideas and reasoning processes that students negotiate collaboratively with teachers and their peers and as independent learners." It also provides opportunities to engage with the key skills of the Junior Cycle Framework, including the skill of being numerate.

At Leaving Certificate, the current curriculum was first examined in 2015, while 2017 was the first year where all candidates taking leaving certificate mathematics had undertaken Project Maths through all of their second level education. In 2012, a bonus point initiative was introduced, offering twenty-five additional bonus points for students who achieved a grade of forty per cent or higher at leaving certificate higher level. This was introduced to encourage more students to study mathematics at higher level in their leaving certificate. It also recognised time demands and perceived difficulty of higher-level mathematics (O'Meara et al., 2020). The current curricula at both Junior Cycle and Leaving Certificate level are underpinned by the Project Maths reforms. In each curriculum, mathematics is seen as an interconnected body of ideas and reasoning processes that students can navigate with the support of teachers, their peers and as individuals (DES, 2013; DES 2017). As curricula continue to evolve, there continues to be calls for both more time to be dedicated for classroom instruction (O'Meara & Prendergast, 2018) and for further professional development opportunities for teachers (Berry et al., 2021) if curricular reform, and its implementation, is to be successful.

A6. International Large-Scale Literacy and Numeracy Initiatives

This section looks at past, current and proposed literacy and numeracy strategies in a range of countries. These may be of use in considering ways in which revisions to the current National Literacy and Numeracy Strategy in Ireland might be made. It should be noted that progress on some of the strategies described here may have been delayed because of COVID-19, and this is reflected in a dearth of evaluation studies on literacy and numeracy strategies on several of the strategies.

Portugal's National Reading Plan 2021-27

The first phase of Portugal's National Reading Plan (PNRP) began in 2006, and continued until 2016. Over that 10-year period, Portugal implemented a set of measures aimed at developing competencies and reading habits of the Portuguese population, with a particular focus on the school population (Republic of Portugal, 2017), as well as on families, local communities and the general public.

The Plan was a response to concerns about literacy levels among the general population, and among young people in particular. The PNRP is the responsibility of the Ministry of Education in coordination with other government departments.

The second phase of the Plan, covering the period 2017-2027, is intended to align it with the national qualifications system, and to increased global literacy levels.

The 2017-2027 plan defines reading literacy as ‘a basic condition that covers all knowledge, a multimodal competence of literacy that combines different languages, texts and formats, and a human right with direct impact on the personal growth of individuals, on national economic, social and cultural development, and on the quality of democracy, inclusion and citizenship’ (Republic of Portugal, 2017, p. 7). The broad aims of the plan are to support:

- *the sustainable growth of productivity, innovation and competitiveness of the economy;*
- *scientific and technological success;*
- *educational success associated with the broadening preschool participation, declining school dropout, and more young people reaching the conclusion of compulsory schooling at 18 years of age;*
- *the improvement of qualifications and competences of the population, in the context of addressing poverty, inequalities, unemployment and social exclusion.*

Elsewhere, it is stated that the updated Plan aims ‘to help Portuguese people to become more literate, competent and prepared to relate to the world in a more critical, cohesive and effective manner, at present and in the future’ (Republic of Portugal, 2017, p., 11). Specific aims include:

- *To facilitate access to reading and knowledge;*
- *To increase habits and reading rates of the population;*
- *To improve competencies and levels of literacy;*
- *To promote pleasure and love of reading;*
- *To improve reading instruction;*
- *To raise awareness about the value and importance of reading;*
- *To stimulate a culture and socio-economic environment favourable to multiple practices and social contexts of reading;*
- *To enhance the presence and mediate the effects of reading in written, printed and digital formats, face-to-face, and on the Internet;*
- *To link reading to science, the humanities, the arts and digital technologies, according to a new ecology that is made of multiple literacies;*

- *To use reading to fight misinformation, prejudice and ignorance.*

The updated plan covers 10 areas of intervention, linked to a wide set of projects and partnerships, at national, regional and local levels. The 10 areas of focus are:

- *Enlarging target audiences (covered by the Plan). These include children in early childhood and their families, young adults and adults in training, with a view to promoting lifelong learning. For example, it is intended to integrate literacy into programmes attended by young adults seeking qualifications. Over 65's are also a target of the Plan.*
- *Encouraging the practice of writing. This includes implementation of writing projects that draw on students' willingness to write on social media, as well as more traditional, school-based forms of writing.*
- *Valuing all literacies. This includes a participating in scientific and technological health activities, promoting health literacy projects, and streamlining financial literacy activities. It recognises the importance of verbal, visual, audio and multi-modal formats, as well as the use of formal, non-formal and informal contexts.*
- *Strengthening reading for pleasure. Recognising the relationship between frequency of reading for pleasure and performance, the focus here is on granting easy access to reading materials, and supporting activities such as Reading Week, a National Reading Contest, dissemination of reading lists and guidelines for various age groups, and encouraging participation in competitions and events that celebrate reading.*
- *Developing collaboration among school, municipal and higher education libraries. This involves launching applications for reading and literacy aimed at schools, families and communities, libraries, companies and associations, in liaison with the School Library Network and the National Public Library Network. A focus on promoting reading among students with special needs is also envisaged.*
- *Linking literacy to science, the arts and technology. The focus here is linking the PNRP to related initiatives such as the launch of new books or authors in the media, signing collaboration agreements with entities responsible for the arts (cinema, music, visual and performing arts), and establishing partnerships with organisations promoting science and digital literacy.*
- *Placing reading and writing at the core in schools. Includes promotion of the use of digital tools as a pedagogical strategy for the motivation and improvement of reading and writing.*

- *Mobilising qualified, experienced, creative and innovative staff. Defines staff broadly to include teachers, families, librarians, mediators, cultural agents, media professionals, volunteers, specialists and others. Involves the creation and dissemination of guidance methodologies, content and training resources on the NRP 2027 web spaces.*
- *Completing and disseminating scientific studies. Includes developing a longitudinal perspective on the evolution of reading skills and practices in Portugal, as well as maintaining an inventory of ongoing studies.*
- *Using the Web as a sharing, dissemination and communication space. Defines the PNRP 2027, along with social networks (Facebook, Twitter, Instagram and You Tube) as the digital media for publishing information related to the Plan, including highlights, evens and news, lists (of readings), projects, activities, competitions and training.*

A number of studies have been published relating to the initial phase of the PNRP. For example, da Costa et al. (2015) examined teachers' perceptions of the PNRP, and concluded that teachers considered that the NRP had a relevant impact on school activities, and on students' practices and attitudes to reading, but were more cautious concerning the impact on students' reading skills, holding the view that skills would improve over a longer period of time. da Costa et al. also referred to resistance on the part of lower-secondary level teachers to the PNRP, as they sought to balance the introduction of new literacy activities with a need to complete the syllabus in preparation for examinations (for example, there was a resistance to the introduction of additional activities and 'other' books that were not on the syllabus). It was noted that implementation of the plan worked better in schools in which special intermediary organizational structures, such as the schools' library network, was already in place. Teachers viewed financial resources, books for guided reading in class, and additional guidelines provided by the PNRP as key components of Plan, though these components worked best when accompanied by support and advice from the school libraries network and regional experts working in the literacy field.

Da Costa et al. also suggested that improved performance on PISA reading literacy in 2009 and 2012 was indicative of the impact of the Plan, with performance reaching OECD average levels in those years, and the proportion of students performing below Level 2 falling from 26.3% in 2000 to 18.8% in 2012 (it was 20% in 2018).

Australia's Proposed National Early Language and Literacy Strategy (NELLS)

In 2020, the Australian Research Alliance for Children and Youth (ARACY), on behalf of the National Early Language and Literacy Coalition (a consortium of organisations working with children under the age of 5) issued a framework for a National Early Language and Literacy Strategy (NELLS) (i.e., a draft National Strategy) (see Renshaw & Goodhue, 2020). The draft strategy outlines priorities (key focus areas), targets or outcomes to be achieved in each priority area, and responses or mechanisms to be leveraged to achieve targets, such as services, policies and engagement strategies.

The central objective of NELLS is to establish a coordinated national approach to enhancing babies' and young children's language and literacy development in Australia. The longer-term goal is to ensure that: 'prior to formal schooling, children are provided with the best opportunities to develop foundational language and literacy skills required to learn, be healthy, develop a positive sense of identity and culture, and participate within their family, community and society throughout their childhood, into adolescence and adulthood' (Renshaw & Goodhue, 2020, p. 3). The NELLS is intended to achieve this by:

- *Establishing a common understanding around early language and literacy development;*
- *Reflecting and building on existing strategies, initiatives, services and programmes;*
- *Identifying priorities, targets and responses in the short, medium and long term.*

The NELLS focuses on areas where early language and literacy is most likely to be nurtured, such as home and family settings (including grandparents and extended family), community settings such as libraries, playgroups and digital platforms, and early childhood education and care settings. The existing systems that would be used in a co-ordinated response include pre-school/kindergarten programmes, child and maternal health services, family, community and welfare services and disability support services, public library networks, and research, evaluation and policy outlets.

Priorities for NELLS encompass four key areas:

- *Family support within communities, including supporting families and carers to confidently engage in reading and literacy learning activities with babies and children in a culturally responsive way, and supporting families to facilitate evidence-based early language and literacy programmes, campaigns and parenting programmes.*
- *Early education and transitions, including ensuring that all children have equity in access to quality early education for at least two years prior to starting compulsory schooling.*
- *Specialist support, including facilitating the early identification of children who require support with language development among young children who have not yet commenced compulsory schooling, and ensuring that evidence-based approaches to early language and literacy development are embedded in initial qualification training and ongoing professional development provided to early childhood educators and teachers.*
- *Knowledge production and dissemination, including providing support for research and evaluation on Australian-based interventions and information sharing on responses and findings.*

The NELLS described early language and literacy outcomes as including receptive and expressive language skills, written language awareness, phonological awareness and composite early language and literacy skills (a measure combing these skills). Secondary outcomes are identified as including executive function skills (e.g., working memory self-regulation, flexible thinking, organisation, reasoning and problem solving), home environment (including children's engagement with literacy, and parents' values and attitudes towards reading), and secondary composite skills (e.g., language, social, emotional and motor skills, and school readiness). In addition to identifying key skills, NELLS provides a broader definition of literacy that would be included in the strategy:

> Literacy is a complex process occurring beyond the primary reading and writing skills and includes social, cultural, digital, gestural and artistic communication. This broader definition is in alignment with the 'multiliteracies' concept which maintains that individuals 'read' the world around them, making meaning via linguistic, visual, audio, spatial and gestural input, far beyond traditional reading and writing (p. 6).

Renshaw and Goodhue also summarise an evidence-based review of effective approaches to developing language and literacy in early childhood, including universally applied approaches, and those to support disadvantaged families. It is

acknowledged that the review does not yet include approaches for children who are clinically at risk.

NELLS highlights the value of focusing a language and literacy strategy on a specific target group, who may not otherwise benefit from a targeted approach that capitalises on the strengths of existing supports, while also extending them in a co-ordinated way.

Victoria's Literacy and Numeracy Strategy

The Australian state of Victoria is currently implementing Phase 2 of a Literacy and Numeracy Strategy, *Achieving Excellence and Equity in Literacy and Numeracy* (Victoria State Government, 2018a). While the initial phase, implemented in 2017, focused for the most part on primary schools, Phase 2 extends this focus to secondary and special schools. The Strategy essentially builds in existing infrastructure (such as the Framework for Improving School Outcomes – FISO), while providing additional resources and professional development, especially for school leaders. The FISO model incorporates the cyclical processes of evaluating and diagnosing, prioritising and setting goals, developing and planning, and implementing and monitoring, with an overall goal of improving student achievement, engagement and wellbeing.

The six actions underpinning the Strategy, as outlined in *A School Leader's Guide to Improve Literacy and Numeracy Outcomes* (Victoria State Government, 2018b) are:

1. *Embed the FISO essential elements* – embed into school culture and practice a commitment to the FISO essential elements, which are viewed as forming the foundation upon which improvement in literacy and numeracy is built.
2. *Identify literacy and numeracy leaders* – Assign Literacy and Numeracy Leaders to work as part of the School Improvement Team to lead whole-school approaches to improve literacy and numeracy.
3. *Annual planning* – Draw on a range of data and evidence to identify literacy and numeracy priorities, refine existing priorities and establish targeted and explicit Key Improvement Strategies (KIS) through the school's annual planning process.
4. *Communities of practice* – Drive school and system improvement through collaborative networks in Communities of Practice, with an explicit focus on literacy and numeracy.
5. *Professional learning communities* – Work through professional learning teams to improve student learning and teacher capability in literacy and numeracy.
6. *Engage parents and carers* – Support parents and carers to engage with their children's literacy and numeracy to establish a sense of partnership in student learning through positive dialogue.

Each element of the framework is supported by an elaboration of the actions that should be taken to evaluate and diagnose, prioritise and set goals, develop and plan, and implement and monitor. There are also lists of relevant resources. For example, under engaging parents and carers, the resources include case studies, a continuum for parents and carers as partners, a document on pathways planning for young people with disabilities, and access to literacy and numeracy portals that enable parental involvement, such as a mathematics teaching toolkit (Birth-Level 10). Under the annual planning strand, an assessment platform that incorporates a range of supplementary tools is described. The tools include an English online interview protocol, a mathematics online interview protocol, diagnostic assessment tools for English, a fractions and decimals online interview, and tools for enhancing the assessment literacy of teachers of English as an additional language.

Finally, it is worth noting that Victoria's Framework for Improving School Outcomes includes key outcomes related to assessment that are designed to support school leaders in literacy and numeracy, including moderation of common student

assessment tasks and data collection, analysis and evaluation of student learning growth over time (key elements of teachers' assessment literacy).

Finland's Proposed National Literacy Strategy

The Reading Office of Finland's National Board of Education is currently preparing a National Literacy Strategy for Finland, with the aim of identifying ways in which to promote literacy, not just among children and young adults, but amongst all people. The Strategy is expected to have regional and municipal dimensions as another aim is to support local institutions and structures already working in the field of literacy (Sauli, 2021).

This new Strategy is intended to expand and refine literacy guidelines developed by the Literacy Forum, and implemented by the Literacy Movement (Lukuliike). The Literacy Movement has been actively promoting children and young adults' literacy and co-ordinating national literacy work in Finland since 2019 (National Board of Education, 2021). It has funded grants for children's, young adults' and adults' literacy, nationwide education, and a pilot experiment in basic education. It has also launched the Reading Municipality Network, which involves 170 multiplicities. The aim has been to increase the reading of children and young people, support growth in communities and strengthen the skills of professionals in cooperation with literacy actors.

The development of the new National Strategy is underpinned by a steering group and a project implementation group.

England's National Strategies (1997-2011)

Between 1997 and 2011[26], a series of initiatives under the broad umbrella of the National Strategies were implemented in England, producing the following:

- *The Early Years Foundation Stage (EYFS) framework and materials, with a particular focus on supporting the narrowing of gaps in early years' outcomes.*
- *Improving attainment and progress of the lowest-attaining 5% of children in primary schools through the Every Child programmes.*

[26] Support materials developed as part of the Literacy and Numeracy Strategies and later, the National Strategies, have been archived at: https://webarchive.nationalarchives.gov.uk/ukgwa/20110113104120/http://nationalstrategies.standards.dcsf.gov. uk/

- *Primary programmes such as the Improving Schools Programme (ISP), which was originally targeted at schools below floor targets but was later extended as a bespoke support to a wider range of schools.*
- *Support for secondary schools below floor targets (National Challenge).*
- *The School Improvement Partner (SIP) programme.*
- *Behaviour and Attendance, including the Social and Emotional Aspects of Learning (SEAL) programme.*
- *Special Educational Needs (SEN), including the Inclusion Development Programme (IDP) and the Achievement for All (AfA) pilot.*
- *Narrowing the Gaps (for pupils on free school meals, black and ethnic minority pupils, and gifted and talented pupils from deprived backgrounds). (DfE, 2011, p. 2-3).*

The National Strategies have also contributed to:

- *Supporting schools in the use of the Assessing Pupils' Progress (APP) materials and the pedagogy of Assessment for Learning (AfL).*
- *Developing data analyses that are designed to help to identify how different groups of pupils are progressing and to promote effective ways of intervening to accelerate the achievements of vulnerable groups.*
- *The continuous drive to support planning and teaching for progression through the development and use of the Primary and Secondary Frameworks.*
- *Promoting the uptake of How Science Works as a key component of the national Science, Technology, Engineering and Mathematics (STEM) agenda and in preparation for the new science GCSEs.*
- *The pilot and national rollout of Functional Skills.*
- *Support to local authorities through National Strategies' regional teams.*

Two of the earliest strategies, the National Literacy Strategy (established in 1997), and the National Numeracy Strategy (1998) are briefly described here:

The National Literacy Strategy was implemented in almost all schools in England from 1998 onwards. It included four key elements:

- *A Framework for Teaching (Department for Education and Employment, 1998a) that outlines teaching objectives for each term for children in the 5–11 age range and provides a structure of time and class management for a daily Literacy Hour.*

- *An ongoing programme of professional development for all primary teachers that centred on a Literacy Training Pack (Department for Education and Employment, 1998b) and related materials.*
- *Community-based elements such as media campaigns, a National Year of Reading, Summer Literacy Schools, and a range of recommendations for agencies and institutions (including universities) involved in the teaching of literacy.*
- *Achievement targets related to performance on national tests (e.g., by 2002, 80% of 11-year-olds should reach the target expected for their age in English (Level 4 on the National Curriculum Assessment in English reading), with Local Education Authorities also expected to establish their own targets in line with the national targets.*

A key feature of the National Literacy Strategy was the literacy hour, which specified the instructional practices that were to be implemented in classrooms on a daily basis. For 5-7 year olds, it included shared reading and writing with the whole class on shared objectives (15 minutes), work with the whole class on sentence- or word-level objectives such as structured grammar and phonic work (15 minutes), guided reading and writing in small groups under the direction of the teacher, or independent work (20 minutes) and a plenary with the whole class where the objectives are reviewed (10 minutes). A curriculum and associated materials were also made available. Hence, both the content and the format of instruction were prescribed.

The National Numeracy Strategy began life as the National Numeracy Project, an intervention designed to improve standards in 200 primary schools in 12 mainly low-achieving Local Education Authorities in England (Brown et al., 2000). The National Numeracy Strategy began in September 1999 in all maintained primary schools in England. According to Brown et al. (2000), the key elements of the Strategy were:

- *an emphasis on calculation, especially mental calculation, including estimation and appropriate selection from a repertoire of different strategies as well as recall of number bonds and times tables;*
- *a three-part template for daily mathematics lessons, starting with 10-15 minutes of oral/mental arithmetic practice, then direct interactive teaching of whole classes and groups, and finally 10 minutes of plenary review;*
- *detailed planning using a suggested week-by-week schedule based on a framework of detailed objectives, specified for each year group;*

- *a systematic and standardised national training programme, using videos and transparencies. The training was to begin out of school with 3 days for key school personnel and governors, to be followed by cascaded in-school training for classroom teachers and classroom assistants.*

Brown et al. (2000) noted that the Numeracy Strategy incorporated a de-emphasis on problems set in 'real-life' contexts and on the curriculum areas of space and shape, data handling and measurement, focusing instead on a ‘back to basics’ mathematics curriculum. The Strategy also specifically aimed to reduce differentiation, and individual work from published schemes. However, because the Statutory National Curriculum was also in place at the time, the Strategy had to include a broad range of curriculum objectives. The Strategy discouraged use of calculators. Not surprisingly, given the longevity of the National Strategies in England, a large number of reports on their impact have been produced. The Department for Education (2011) produced an omnibus report that summarised the findings of the main evaluation studies in 17 different areas, including primary literacy, primary numeracy, secondary literacy, secondary numeracy and narrowing the gaps. For example, in the case of primary literacy, it was concluded that standards had been ‘transformed’, with English attainment above 80% (of students reaching Level 4+), and writing attainment increasing by 8% in the final five years of the National Strategies. It was also noted that ethnic groups had closed the performance gap, with an improvement of 21% by 2010. According to the authors of the report, it had always been intended to wind down the National Strategies after a fixed period of time, and transfer responsibility for maintaining and raising standards back to schools and teachers.

Conclusion

A number of key characteristics of large-scale literacy and numeracy strategies can be identified, which may be worth considering in the Irish context. These include:

- Building on and adding to existing infrastructure. This often involves leveraging existing support services such as childcare settings, library systems and schools to improve standards in literacy and numeracy. This is evident in Portugal’s National Reading Plan, and in the proposed National Literacy Strategy for Finland. In the case of Victoria, Australia, the Literacy and Numeracy Strategy draws heavily on the existing Framework for Improving School Outcomes.

- An emphasis on equity, through reducing equity gaps and addressing the needs of children with learning difficulties and special needs. This involves reducing achievement gaps between, for example, disadvantaged and other students. This was evident in England's National Strategies and can be seen in Australia's proposed National Early Language and Literacy Strategy. A focus on equity also implies a consideration of the most effective ways in which to assess the learning of students with special education needs.

- A level of autonomy for schools and teachers, matched with appropriate support. It is generally recognised that England's National Strategies were over-prescriptive, with the content of instruction, and the methodologies to be used in teaching that content, handed down by central authorities, with implementation overseen by the inspectorate (Brown et al., 2000). More recent Strategies, such as Portugal's National Reading Plan 2021-27 are designed to support the work of teachers, mainly through the provision of professional development and additional resources. Similarly, Victoria's Literacy and Numeracy Strategy places a strong emphasis on in-school management of literacy and numeracy development and on the professional development of literacy leaders and teachers. For example, it draws heavily on the communities of practice and professional learning communities' models of teacher professional development.

- A focus on parents and community. Most Literacy and Numeracy Strategies include a strong emphasis on parents and community. In the case of Finland's National Literacy Strategy, which is currently under development, there will be an emphasis on supporting the growth of literacy in communities. Similarly, the proposed Australian National Early Language and Literacy Strategy recognises the key role of families in developing children's early language and literacy learning, by including family support within communities as one of its four main strands.

- An effort to increase interest in reading and promote reading for enjoyment. Many of the strategies considered here, including those of Portugal and Finland, emphasise the promotion of reading for enjoyment, or the promotion of reading more generally. This is a key area of concern, given that the frequency with which adolescents read for enjoyment has declined significantly in recent years, while the correlation between frequency of reading for enjoyment and reading achievement remains strong (see OECD, 2021).

- An emphasis on data analysis and the interpretation of evidence. The Victoria, Australia Reading Literacy Strategy, for example, includes (under the Annual Planning strand) drawing on a range of data and evidence to identify literacy and numeracy priorities, and establish improvement strategies. A focus on data implies that school leaders and teachers should have high levels of assessment literacy, that encompass both the interpretation of performance based on formative and summative assessment, and the ability to interpret and reflect critically on the outcomes of intervention efforts.

- Attention to writing, as well as reading literacy. Portugal's National Reading Plan includes an explicit emphasis on writing as well as reading literacy. Moreover, it is recognised in the Plan that support for writing development can extend to social media, as well as more school-based forms of writing. An implication of including an emphasis on writing is that arrangements to assess writing may also need to be put in place.

- A recognition of the increasing role of technology in the development of children's literacy and numeracy. This recognition is apparent in definitions of literacy, aims of literacy strategies, the promotion of literacy, and, in some cases, the assessment of literacy and numeracy. An implication of this is that digital resources should be integrated into all aspects of a Literacy and Numeracy Strategy, including the dissemination of information and resources.

References for Part A

Afflerbach, P., & Cho, B.Y. (2009). Identifying and describing constructively responsive comprehension strategies in new and traditional forms of reading. In S.E. Israel & G. Duffy (Eds.), *Handbook of research on reading comprehension* (pp. 69-90). Routledge.

Alexander, R. J. (2013). Improving oracy and classroom talk: Achievements and challenges. *Primary First*, *10*, 22–29. http://eprints.whiterose.ac.uk/76321/

Allington, R. L., & McGill-Franzen, A. (2021). Reading volume and reading achievement: A review of recent research. *Reading Research Quarterly, 56*(S1), pp. S231–S238. https://doi.org/10.1002/rrq.404

Archer, P., & Weir, S. (2004). *Addressing disadvantage: A review of the international literature and strategy in Ireland.* Report submitted to the Educational Disadvantage Committee. ERC. http://www.erc.ie/documents/edc_addressing_disadvantage.pdf

Archer, P. & Shortt, F. (2003). *Review of the Home/School/Community Liaison Scheme*. Dublin: Educational Research Centre. https://www.erc.ie/documents/hsclreview03.pdf

Barnett, W. (2001). Preschool education for economically disadvantaged children: Effects on reading achievement and related outcomes. In S. B. Neuman and D. K. Dickinson (Eds.)., *Handbook of early literacy research* (pp. 421-443). The Guilford Press.

Benner, G. J., Nelson, J. R., & Epstein, M. H. (2002). Language skills of children with EBD: A literature review. *Journal of Emotional and Behavioral Disorders, 10*(1), 43–56. https://doi-org.dcu.idm.oclc.org/10.1177/106342660201000105

Berry, E., Bray, A., & Oldham, E. (2021). Reflection on project maths after ten Years: To what extent have teaching methods changed? In M. Kingston & P. Grimes (eds.), *Proceedings of the Eighth Conference on Research in Mathematics Education in Ireland (MEI 8)*, 133–140. https://doi.org/10.5281/zenodo.5636936

Biggart, A., Kerr, K., O'Hare, L. and Connolly, P. (2012). *Evaluation of the effectiveness of the Childhood Development Initiative's Doodle Den Literacy Programme*. https://www.cdi.ie/wp-content/uploads/2016/11/Doodle-Den-Report-web-version.pdf

Bleach, J. (2015). Improving numeracy outcomes for children through community action research. *Educational Action Research*. *23*(1), 22-35. https://doi.org/10.080/09650792.2014.994016.

Brown, M., Millett, A., Bibby, T., & Johnson, D. C. (2000). Turning our attention from the what to the how: The National Numeracy Strategy. *British Educational Research Journal*, *26*(4), 457–471. http://www.jstor.org/stable/1501387

Burke, D. (2014). Audit of mathematics curriculum policy across 12 jurisdictions. National Council for Curriculum and Assessment. http://ncca.ie/en/Publications/Reports/Audit-mathematics-curriculum-policy.pdf

Camacho, A. Alves, R.A. & Boscolo, P. (2021). Writing motivation in school: A systematic review of empirical research in the early twenty-first century. *Educational Psychology Review, 33,* 213–247 https://doi.org/10.1007/s10648-020-09530-4

Centre for Early Childhood Development & Education, [CECDE]. (2006*). Síolta, the National Quality Framework*. https://siolta.ie/media/pdfs/final_handbook.pdf

Christenson, S.L., Reschly, A.L. & Wylie, C. (2012). *Handbook of research on student engagement.* Springer.

An Chomhairle um Oideachas Gaeltachta & Gaelscolaíochta (COGG) with NEPS (2020). *Cur chuige cothromaithe i leith fhorbairt na litearthachta i mbunranganna na bunscoile*. https://www.gov.ie/ga/foilsiuchan/cur-chuige-cothromaithe-i-leith-na-litearthachta-i-mbunranganna-na-bunscoile/

Coiro, J., & Dobler, E. (2007). Exploring the comprehension strategies used by sixth-grade skilled readers as they search for and locate information on the Internet. *Reading Research Quarterly, 42***,** 214-257. http://dx.doi.org/10.1598/RRQ.42.2.2

Confrey, J. (2019). *A synthesis of research on learning trajectories/progressions in mathematics.* https://www.oecd.org/education/2030/A-Synthesis-of-Research-on-Learning-Trajectories-Progressions-in-Mathematics.pdf

Council of Europe. (2001). *Common European Framework of reference for languages: Learning, teaching, assessment*. Cambridge University Press. http://www.coe.int/t/dg4/linguistic/Source/Framework_EN.pdf

Council of the European Union. (2011). Council conclusions of 15 June 2011 on early childhood education and care: Providing all our children with the best start for the world of tomorrow. *Official Journal of the European Union*. https://op.europa.eu/en/publication-detail/-/publication/f9674565-5714-4453-8dd1-72126e63b423/language-en

Council of Europe. (2018). *Common European Framework of reference for languages: Learning, teaching, assessment: Companion volume with new descriptors*. Council of Europe. https://rm.coe.int/cefr-companion-volume-with-new-descriptors-2018/1680787989

da Costa, A.F., Pegado, E., Ávila, P. et al. (2015). Evaluating the Portuguese National Reading Plan: teachers' perceptions on the impact in schools. *Educational Research for Policy and Practice, 14*, 119–138. https://doi.org/10.1007/s10671-014-9171-y

Darmody, M., & Smyth, E. (2016). *Entry to programmes of initial teacher education*. The Economic and Social Research Institute. https://www.esri.ie/system/files/media/file-uploads/2016-10/BKMNEXT299.pdf

Delaney, S. (2020). *Number in the senior primary classes*. Commissioned research paper. National Council for Curriculum and Assessment. https://ncca.ie/media/4622/primary_maths_research_number_seniorclasses.pdf

Department for Education and Employment. (1998a). *The National Literacy Strategy: Framework for teaching.* Author.

Department for Education and Employment. (1998b). *The National Literacy Strategy: Literacy training pack*. Author.

Department for Education (DfE, UK). (2011). *The National Strategies: 1997-2011. A brief summary of the impact and effectiveness of the National strategies*. Crown Publications/DfE. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/175408/DFE-00032-2011.pdf

Department for Children and Youth Affairs. (2016). *Diversity, equality and inclusion charter and guidelines for early childhood education and care.* Dublin: Government Publications. https://assets.gov.ie/38186/c9e90d89d94b41d3bf00201c98b2ef6a.pdf

Department of Education and Science. (1969). *Rutland Street Project*. Dublin: Stationery Office.

Department of Education and Science. (1994). *Early Start Programm*e. Dublin: Stationery Office.

Department of Education and Science. (1996). *Breaking the Cycle Programm*e. Dublin: Stationery Office.

Department of Education and Science. (1999). *Primary school curriculum*. Dublin: Stationery Office. https://www.curriculumonline.ie/getmedia/c4a88a62-7818-4bb2-bb18-4c4ad37bc255/PSEC_Introduction-to-Primary-Curriculum_Eng.pdf

Department of Education and Science. (1999). *Primary school mathematics curriculum.* Dublin: Stationery Office. http://www.ncca.ie/uploadedfiles/Curriculum/Maths_Curr.pdf

Department of Education and Science. (2005a). *Delivering equality of opportunity in schools.* Dublin: Stationery Office. https://www.erc.ie/documents/na2009_report.pdf

Department of Education and Science Inspectorate. (2005b). *Literacy and numeracy in disadvantaged schools (LANDS).* Dublin: Stationery Office.

Department of Education and Science, [DES]. (2009*). Effective literacy and numeracy practices in DEIS schools. Inspectorate Good Practice Guides*. https://assets.gov.ie/25336/334ac761887848d083059feb554fa86c.pdf

Department of Education and Skills (DES). (2011). *Literacy and numeracy for learning and life: The national strategy to improve literacy and numeracy among children and young people 2011–2020*. Author. https://assets.gov.ie/24520/defd56aec10946798ab2d32a42dc0d86.pdf

DS. (2012*). School self-evaluation guidelines 2012-2016 primary*. Author

DES. (2013). *Leaving Certificate mathematics syllabus. Foundation, ordinary and higher level*. Stationary Office.

DES. (2015). *Framework for Junior Cycle 2015*. Author. https://ncca.ie/media/3249/framework-for-junior-cycle-2015- en.pdf

DES. (2016a). *Looking at our schools: A quality framework for primary 2016-2020*. Author.https://assets.gov.ie/234614/8f6a05a1-c4bb-4d8e-b892-04fb43acf69d.pdf

DES. (2016b). *School self-evaluation 2016-2020 primary.* Author. *https://assets.gov.ie/25262/f4a6f2a21e1c4c26a55234511085d5a3.pdf*

Department of Education and Skills (DES). (2017a). *Literacy and numeracy for learning and life: The national strategy to improve literacy and numeracy among children and young people 2011–2020, Interim Review: 2011 – 2016, New Targets: 2017 – 2020*. Author. https://assets.gov.ie/24960/93c455d4440246cf8a701b9e0b0a2d65.pdf

Department of Education and Skills (DES). (2017b). *DEIS plan 2017. Delivering equality of opportunity in schools*. Dublin: Author. Accessed at https://www.gov.ie/en/publication/0fea7-deis-plan-2017/

Department of Education and Skills. (2018). *National Síolta Aistear Initiative: Review of the current NSAI mentoring model.* https://assets.gov.ie/41228/ff6a0ec8b76c4de9af5b6ae40e6471b5.pdf

Department of Education and Skills. (2019*). Professional award criteria and guidelines for initial professional education (Level 7 and Level 8) Degree programmes for the early learning and care (ELC) sector in Ireland*. Author. https://assets.gov.ie/30316/784a2158d8094bb7bab40f2064358221.pdf

Department of Education. (2020). *Retention rates of pupils in second-level schools - 2013 cohort*. Author. https://assets.gov.ie/95804/61fa5237-a4de-401c-9c65-aa0f693bde2f.pdf

Department of Education. (2021). *Retention rates of pupils in second-level schools - 2014 cohort.* Author. https://assets.gov.ie/203522/017c3bc0-011c-468a-af67-f3e3091a1df4.pdf

Department of Education and Skills (2017). *Junior cycle mathematics specification.* Stationary Office.

Dietrichson, J., Bøg, M., Filges, T., & Klint Jørgensen, A.-M. (2017). Academic interventions for elementary and middle school students with low socioeconomic status: A systematic review and meta-analysis. *Review of Educational Research, 87*(2), 243–282. https://doi.org/10.3102/0034654316687036

Dobinson, K. L. & Dockrell, J.E. (2021). Universal strategies for the improvement of expressive language skills in the primary classroom: A systematic review. *First Language,* 1-28. Sage. https://doi-org.dcu.idm.oclc.org/10.1177/0142723721989471

Dooley, T., Dunphy, E. & Shiel, G. (with Butler, D., Corcoran, D., Farrell, T., NicMhuirí, S., O'Connor, M., Travers, J. & Perry, B.) (2014). Mathematics in early childhood and primary education (3-8 years). Teaching and learning. NCCA. https://ncca.ie/media/2147/ncca_research_report_18.pdf

Dooley, T. (2019). *Learning and teaching primary mathematics. An addendum to NCCA research reports 17 and 18*. NCCA. https://ncca.ie/media/4087/primary_maths_research_addendum_2019.pdf

Duncan, G., Magnuson, K., Kalil, A. and Ziol-Guest, K. (2011). The importance of early childhood poverty. *Social Indicators Research*, 108 (1), 87-98. https://www.jstor.org/stable/23261304

Dunphy, L., Dooley, T., & Shiel, G. (2014). *Mathematics in early childhood and primary education (3-8 years). Definitions, theories, development and progression*. NCCA. https://ncca.ie/media/1494/maths_in_ecp_education_theories_progression_researchreport_17.pdf

Education Department of Western Australia. (1994). *Writing: Developmental continuum*. Longman Cheshire.

Education Endowment Foundation (2021). What Works Centre for Education. https://educationendowmentfoundation.org.uk/

Early Learning Initiative, [ELI], (2010). *NEYAI Full Application Form October 2010 National College of Irelan*d. November 26. National College of Ireland (unpublished).

Educational Research Centre (ERC). (2002). *Drumcondra Sentence Reading Test*. Dublin: Educational Research Centre.

Educational Research Centre (ERC). (2006). *Drumcondra Primary Mathematics Test-Revised*. Dublin: Educational Research Centre.

Eivers, E., Shiel, G., & Shortt, S. (2004). *Reading literacy in disadvantaged primary schools*. Educational Research Centre. https://www.erc.ie/documents/litdis_report.pdf

Eivers, E., Close, S., Shiel, G., Millar, D., Clerkin, A., Gileece, L. & Kiniry, J. (2010). The 2009 National Assessments of Mathematics and English

Reading. Government Publications. https://www.erc.ie/documents/na2009_report.pdf

Eivers, E., & Delaney, M. (2018). PIRLS and ePIRLS 2016: *Test content and Irish pupils' performance*. Educational Research Centre. https://www.erc.ie/wp-content/uploads/2018/08/Report-series-4-Online-version.pdf

Exodea Consulting. (2014). *Happy Talk. NEYAI Consortium evaluation. Final report*. https://corkcitypartnership.ie/wp-content/uploads/2013/09/Happy-Talk-Evaluation-Final-Report.pdf

French, G. (2014). *"Let them talk". Evaluation of the Language Enrichment Programme of the Ballyfermot Early Years Language and Learning Initiative.* Ballyfermot/Chapelizod Partnership. https://doras.dcu.ie/24304/

Government of Ireland. (2019). *First 5: A Whole-of-Government Strategy for Babies, Young Children and their Families 2019-2028*. Author. https://first5.gov.ie/

Government of Ireland. (1999). *Ready to learn*. White Paper on Early Childhood Education. https://assets.gov.ie/24631/4adbb26bec8d4f43b9d529919d47536c.pdf

Graham, S. (2019). Changing how writing is taught. *Review of Research in Education, 43*(1), 277–303. https://doi.org/10.3102/0091732X18821125

Grønmo, L.S., Lindquist, M., Arora, A., & Mullis, I., (2015). *TIMSS 2015 Mathematics framework* (pp. 11-27). International Association for the Evaluation of Educational Achievement. https://timssandpirls.bc.edu/timss2015/downloads/T15_FW_Chap1.pdf

Guthrie, J. T., Klauda, S. L., & Ho, A. N. (2013). Modeling the relationships Among reading instruction, motivation, engagement, and achievement for adolescents. *Reading Research Quarterly, 48*(1), 9–26. https://doi.org/10.1002/rrq.035

Heritage, M. (2008). *Learning progressions: Supporting instruction and formative assessment.* Council of State School Officers.

Hoyles, C., Noss, R., Kent, P., & Bakker, A. (2010). *Improving mathematics at work: the need for techno-mathematical literacies*. Routledge.

Inspectorate, Department of Education and Skills. (2015a). *Looking at action planning for improvement in DEIS primary schools*. Author. https://assets.gov.ie/25273/0771d5663800429eaab15f8897ea164e.pdf

Inspectorate, Department of Education and Skills. (2015b). *Looking at action planning for improvement in DEIS post-primary schools*. Author. https://assets.gov.ie/25270/bd5eef4572af4b10970923837660cf1f.pdf

Inspectorate, Department of Education and Skills. (2015b). *Looking at action planning for improvement in DEIS post-primary schools.* Author. https://assets.gov.ie/25270/bd5eef4572af4b10970923837660cf1f.pdf

Jablonka, E. (2015). The evolvement of numeracy and mathematical literacy curricula and the construction of hierarchies of numerate or mathematically literate subjects. *ZDM Mathematics Education, 47*, 599–609. https://doi.org/10.1007/s11858-015-0691-6

Kavanagh, L., Shiel, G., Gilleece, L. & Kiniry, J. (2015). *The 2014 National Assessments of English Reading and Mathematics. Volume 2: Context report*. Educational Research Centre. http://www.erc.ie/wp-content/uploads/2016/09/NA-Context-Report-Oct_2016.pdf

Kavanagh, L. & Weir, S. (2018). *The evaluation of DEIS: The lives and learning of urban primary school pupils, 2007-2016*. Educational Research Centre. https://www.erc.ie/wp-content/uploads/2018/09/DEIS_2018_Online.pdf

Kavanagh, L., Weir, S. & Moran, E. (2017). *The evaluation of DEIS: Monitoring achievement and attitudes among urban primary school pupils*. Educational Research Centre. https://www.erc.ie/wp-content/uploads/2017/06/DEIS-report-2017.pdf

Kennedy, E. & Shiel, G. (2022a). *Addressing achievement gaps between disadvantaged and non-disadvantaged students in primary and post-primary schools: A review of recent international research*. DCU, IoE. https://doi.org/10.5281/zenodo.7865216

Kennedy, E. & Shiel, G. (2022b). Writing assessment for communities of writers: Validation of a scale to support teaching and assessment of writing in Pre-K to Grade 2. Special Issue: Formative Writing Assessment for Change, *Assessment in Education: Principles, Policy and Practice.* DOI: 10.1080/0969594X.2022.2047608

Kennedy, E. & Shiel, G. (2019). *Writing pedagogy in the senior primary classes: Knowledge, skills and processes for writing.* NCCA. https://ncca.ie/media/4121/writing-pedagogy-in-the-senior-primary-classes.pdf

Kennedy, E. (2018). Engaging readers and writers in high-poverty contexts. *Journal of Research in Reading, 41*(4), 716-731. https://doi-org.dcu.idm.oclc.org/10.1111/1467-9817.12261

Kennedy, E. (2017). Transforming literacy outcomes in high-poverty schools: An evidence-based approach. In C. Ng & B. Bartlett (Eds.): *Improving reading in the 21st century: International research and innovation.* Springer.

Kennedy, E. (2013). Literacy policy in Ireland. *European Journal of Education, 48*(4), 511-527. https://doi-org.dcu.idm.oclc.org/10.1111/ejed.12053

Kennedy, E., Dunphy, E., Dwyer, B., O'Connor, M., Hayes, G., McPhillips, T., Marsh, J., & Shiel, G. (2012). *Literacy in early childhood and primary education (children aged 3–8 years).* National Council for Curriculum and Assessment. https://ncca.ie/media/2137/literacy_in_early_childhood_and_primary_education_3-8_years.pdf

Kilpatrick, J. (2001). Understanding mathematical literacy: The contribution of research. *Educational Studies in Mathematics*, *47*, 101–116. https://doi.org/10.1023/A:1017973827514

Kuiper, E. & Volman, M. (2008). The web as a source of information for K-12 education. In J. Coiro, M. Knobel, C. Lankshear, & D. J. Leu, (eds.). *Handbook of Research on New Literacies* (pp. 267-296). Erlbaum.

Ladson-Billings, G. (2014). Culturally relevant pedagogy 2.0: A.k.a. the remix. *Harvard Educational Review, 84*(1), 74–84.

Leavy, A. (2020). *Data and chance in the senior primary classes.* Commissioned Research Paper for National Council for Curriculum and Assessment. https://ncca.ie/media/4620/primary_maths_research_data_and_chance_seni orclasses.pdf

Leu, D. J., Kinzer, C. K., Coiro, J., Castek, J., & Henry, L.A. (2018). New Literacies. In D. E. Alvermann, N. J. Unrau, M. Sailors, & R. B. Ruddell (Eds)., *Theoretical models and processes of reading (*7th ed., pp.319-346*).* New York: Routledge.

Lysaght, Z., Scully, D., Murchan, D., O'Leary, M., & Shiel, G. (2019). *Aligning learning, assessment and teaching in curricular reform and implementation*. Dublin: NCCA.

Mallows, D., & Carpentieri, J. D. (2015, August). Policy coherence. In *EBSN Annual Collaborative Workshop*.

May, P. J., Sapotichne, J., & Workman, S. (2006). Policy coherence and policy domains. *Policy Studies Journal*, *34*(3), 381-403.

McCoy, S., Quail, A. & Smyth, E. (2014). The effects of school social mix: Unpacking the differences', *Irish Educational Studies*, 33 (3): 307-330. http://dx.doi.org/10.1080/03323315.2014.955746

McGillicuddy, D. & Devine, D. (2018). "Turned off "or "ready to fly"- Ability grouping as an act of symbolic violence in primary school. *Teaching and Teacher Education, 70* (C), p.88-99. https://doi-org.dcu.idm.oclc.org/10.1016/j.tate.2017.11.008

McGillicuddy, D. (2013). *Cycle of constraint: A study of perspective and practice of ability grouping for literacy and numeracy in DEIS primary schools in Ireland*. DCYA.

McKeown, C., Denner, S., McAteer, S., & Shiel, G with O'Keeffe, L. (2019). Learning for the future: The performance of 15-year-olds in Ireland on reading literacy, science and mathematics in PISA 2018. ERC. https://www.erc.ie/wp-content/uploads/2020/07/B23321-PISA-2018-National-Report-for-Ireland-Full-Report-Web-4.pdf

Mullis, I. V. S., Martin, M. O., Foy, P., & Hooper, M. (2017). *PIRLS 2016 International Results in Reading.* Retrieved from Boston College, TIMSS &

PIRLS International Study Center website: http://timssandpirls.bc.edu/pirls2016/international-results/

McCutchen, D., Teske, P., & Bankston, C. (2008). Writing and cognition: Implications of the cognitive architecture for learning to write and writing to learn. In C. Bazerman (Ed.), *Handbook of research on writing: History, society, school, individual, text* (pp. 451-470). New York, NY: Taylor & Francis Group/Lawrence Erlbaum Associates. https://doi.org/10.1080/02671522.2011.637640

Mullis, I. V. S., Martin, M. O., Foy, P., & Hooper, M. (2017). *PIRLS 2016 International Results in Reading.* Retrieved from TIMSS & PIRLS International Study Center website. http://timssandpirls.bc.edu/pirls2016/international-results/

Myhill, D. A., Jones, S. M., Lines, H., & Watson, A. (2012). Re-thinking grammar: the impact of embedded grammar teaching on students' writing and students' metalinguistic understanding. *Research Papers in Education*, *27*(2), 139–166. https://doi-org.dcu.idm.oclc.org/10.1080/02671522.2011.637640

National Board of Education (Finland). (2021, 25th Jan). *National literacy strategy to strengthen literacy work*. National Board of Education. Accessed at: https://www.oph.fi/fi/uutiset/2021/kansallinen-lukutaitostrategia-vahvistamaan-lukutaitotyota?fbclid=IwAR1a14pI7McYquL___-8yeOXNCB67pFNbxMu4zqEw0dJzG_EJtKgx5xhO43Y

National Council for Curriculum and Assessment (NCCA). (2005). *Primary curriculum review, phase 1.* Final Report with recommendations. National Council for Curriculum and Assessment. Authopr. https://ncca.ie/media/1497/primary_curriculum_review_phase_1_final_report_with_recommendations_8.pdf

NCCA. (2012). *Project Maths: Responding to the current debate.* National Council for Curriculum and Assessment. Author. https://ncca.ie/media/2275/project-maths-responding-to-current-debate.pdf

NCCA. (2009). *Aistear, the Early Childhood Curriculum Framework.* Dublin: National Council for Curriculum and Assessment. https://ncca.ie/en/resources/aistear-the-early-childhood-curriculum-framework/

NCCA. (2016). *Background paper and brief for the development of a new primary mathematics curriculum.* Author. https://ncca.ie/media/1341/maths_background_paper_131016_tc.pdf

NCCA. (2020). *Draft Primary Curriculum framework: Primary Curriculum review and redevelopment*. Author. https://ncca.ie/media/4456/ncca-primary-curriculum-framework-2020.pdf

NCCA. (n.d.). *Primary Language Curriculum/Curaclam Teanga na Bunscoile: Support materials for teachers. Author.*

https://curriculumonline.ie/getmedia/3ac44a69-57f9-49ea-80db-ebec76831111/PLC-Support-Materials_All-Strands-Final.pdf

NEPS. (2016). A balanced approach to literacy development in the early years.https://assets.gov.ie/40640/dab7f9cd97a84c1db2990023c5de2445.pdf

NEPS/DES. (2007). *Special educational needs: A continuum of support. Guidelines for Teachers*. Department of Education and skills. https://assets.gov.ie/40642/674c98d5e72d48b7975f60895b4e8c9a.pdf

NEPS/DE (2019). *Effective interventions for struggling readers* (2nd ed). Department of Education. https://assets.gov.ie/24811/6899cf6091fb4c3c8c7fce50b6252ec2.pdf

Nic Mhuirí, S. (2020a). *Measures in the senior primary classes.* Commissioned research paper for National Council for Curriculum and Assessment. https://ncca.ie/media/4626/primary_maths_research_measures_seniorclasse s.pdf

Nic Mhuirí, S. (2020b). *Shape and space in the senior primary classes.* Commissioned Research Paper for National Council for Curriculum and Assessment. https://ncca.ie/media/4624/primary_maths_research_shape_and_space_seni orclasses.pdf

No Child Left Behind Act (NCLB). (2000). *Public Law PL107-110.* https://files.eric.ed.gov/fulltext/ED556108.pdf

Ó Duibhir, P., & Cummins, J. (2012). *Towards an integrated language curriculum in early childhood and primary education (3-12 years)*. NCCA. https://www.ncca.ie/media/2467/towards_an_integrated_language_curriculum_in_early_childhood_and_primary_education.pdf

OECD, (2021). *21st-century readers: Developing literacy skills in a digital world. OECD Publications.* https://www.oecd.org/publications/21st-century-readers-a83d84cb-en.htm

OECD. (2012). *Literacy, numeracy and problem solving in technology-rich environments. Framework for the OECD survey of adult skills.* OECD Publishing.

OECD. (2019). *PISA 2018 Results Volume 1: What students know and can do*. Paris: OECD Publishing. https://www.oecd.org/publications/pisa-2018-results-volume-i-5f07c754-en.htm

O'Gorman, R. (2022). *Minister O'Gorman secures €1 billion investment in early learning and childcare*. https://www.gov.ie/en/press-release/d422b-minister-ogorman-secures-1bn-investment-in-early-learning-and-childcare/

O'Meara, N., & Prendergast, M. (2018). Time allocated to mathematics in post-primary schools in Ireland: are we in double trouble? *International Journal of Mathematical Education in Science and Technology, 49*(4), 501-516. https://doi-org.dcu.idm.oclc.org/10.1080/0020739X.2017.1409369

O'Meara, N., Prendergast, M., & Treacy, P. (2020). What's the point? Impact of Ireland's bonus points initiative on student profile in mathematics classrooms. *Issues in Educational Research, 30*(4), 1418-1441. https://www.iier.org.au/iier30/omeara.pdf

Oracy All-Party Parliamentary Group Inquiry (2021). Speak for Change. Final report and recommendations from the Oracy All-Party Parliamentary Group Inquiry. APPG. https://oracy.inparliament.uk/sites/oracy.inparliament.uk/files/2021-04/Oracy_APPG_FinalReport_28_04%20%284%29.pdf

Pangrazio, L., Godhe, A.-L., & Ledesma, A. G. L. (2020). What is digital literacy? A comparative review of publications across three language contexts. *E-Learning and Digital Media*, *17*(6), 442–459. https://doi.org/10.1177/2042753020946291

Patiño, J. F., Calixto, A. L., Chiappe, A., & Almenarez, F. T. (2020). ICT-driven writing and motor Skills: A Review. *International Electronic Journal of Elementary Education, 12*(5), 489–498. https://www.iejee.com/index.php/IEJEE/article/view/1074

PDST. (2020). *Literacy development in the primary classroom: Six key components.* https://www.pdst.ie/sites/default/files/Literacy%20Development%20in%20the%20Primary%20Classroom.pdf

Putman, S. M. (2014. Exploring dispositions toward online reading: Analyzing the survey of online reading attitudes and behaviors, *Reading Psychology*, *35*(1),1-31. https://doi-org.dcu.idm.oclc.org/10.1080/02702711.2012.664250

Renshaw, L., & Goodhue, R. (2020). *National early language and literacy strategy: Discussion paper*. ARACY for The National Early Language and Literacy Coalition. https://earlylanguageandliteracy.org.au/wp-content/uploads/2020/10/National-Early-Language-and-Literacy-Discussion-Paper-2020.pdf

Republic of Portugal. (2017). *Strategic framework. National Reading Plan 2027*. https://www.pnl2027.gov.pt/np4EN/file/8/NRPframework.pdf

Plano Nacional de Leitura 2027. Accessed at: https://www.pnl2027.gov.pt/np4EN/file/8/NRPframework.pdf

Roulstone, S., Law, J., Rush, R., Clegg, J., & Peters, T. (2011). *Investigating the role of language in children's early educational outcomes*. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/181549/DFE-RR134.pdf

Sahlberg, P. (2012). *Report of the International Review Panel on the structure of initial teacher education provision in Ireland: Review conducted on behalf of the Department of Education and Skills*. DES. https://hea.ie/assets/uploads/2017/05/Review-of-Structure-of-Teacher-Education.pdf

Sahlberg, P. (2019). *The structure of teacher education in Ireland: Review of progress in implementing reform*. Higher Education Authority. https://hea.ie/assets/uploads/2019/05/HEA-Structure-of-Teacher-Education.pdf

Sarama, J., & Clements, D. H. (2009). *Early childhood mathematics education research: Learning trajectories for young children*. Taylor and Francis.

Sauli, A. (2021, 2nd Feb). *A national literacy strategy will further literacy work in Finland*. Libraries.fi Public Libraries in Finland. Accessed at: https://www.libraries.fi/news/a-national-literacy-strategy-will-further- literacy-work-in-Finland?language_content_entity=en

Schoon, I., Parsons, S., Rush, R., & Law, J. (2010). Childhood language skills and adult literacy: A 29-year follow-up study. *Pediatrics, 125*(3), e459–e466. https://doi.org/10.1542/peds.2008-2111

Sense About Science. (2018). *Transparency of evidence: a spot check of government policy proposals July 2016 to July 2017*. Author. https://senseaboutscience.org/activities/transparency-evidence-spot-check/

Shuey, E. and M. Kankaraš (2018). "*The Power and Promise of Early Learning"*, *OECD Education Working Papers, No. 186*. OECD Publishing. https://dx.doi.org/10.1787/f9b2e53f-

Snow, P. C. (2016). Elizabeth Usher Memorial Lecture: Language is literacy is language –Positioning speech-language pathology in education policy, practice, paradigms and polemics. *International Journal of Speech Language Pathology*, *18*(3), 216–228. https://doi.org/10.3109/17549507.2015.1112837

Spencer, S., Clegg, J., Stackhouse, J., & Rush, R. (2017). Contribution of spoken language and socio-economic background to adolescents' educational achievement at age 16 years. *International Journal of Language & Communication Disorders*, *52*(2), 184–196. https://doi.org/10.1111/1460-6984.12264

Shiel, G., French, G. Kennedy, E., & McCormack M. (2022). *Impact of the DEIS Strategy and National Literacy and Numeracy Strategy at ECEC, Primary and Post-Primary Levels*. Dublin: DCU. https://doi.org/10.5281/zenodo.7869158

Shiel, G., Kavanagh, L., Millar, D. (2014). *National Assessment of English Reading and Mathematics*. Volume 1. Performance Report. Dublin: ERC. http://www.erc.ie/wp-content/uploads/2016/11/NA_2014_Vol1_Final-updated.pdf

Shiel, G., & Kelleher, C. (2017). *An evaluation of the impact of Project Maths on the performance of students in junior cycle mathematics*. ERC/NCCA. https://ncca.ie/media/3629/pm_evaluation_strand1_2017.pdf

Shiel, G. Cregan, A. McGough, A. & Archer, P. (2012). *Oral language in early childhood and primary education (3-8 years).* National Council for Curriculum and Assessment. https://www.erc.ie/documents/oral_language_in_early_childhood_and_primary_education_3-8_years_.pdf

Smyth, E., McCoy, S., & Kingston, G. (2015). *Learning from the evaluation of DEIS* (Research Report No. 39). Educational and Social Research Institute. https://www.esri.ie/system/files/publications/RS39.pdf

Snow, P. C. (2016). Elizabeth Usher Memorial Lecture: Language is literacy is language –Positioning speech-language pathology in education policy, practice, paradigms and polemics. *International Journal of Speech Language Pathology*, *18*(3), 216–228. https://doi.org/10.3109/17549507.2015.1112837

Spencer, S., Clegg, J., Stackhouse, J., & Rush, R. (2017). Contribution of spoken language and socio-economic background to adolescents' educational achievement at age 16 years. *International Journal of Language & Communication Disorders*, *52*(2), 184–196. https://doi.org/10.1111/1460-6984.12264

Taggart, B., Sylva, K., Melhuish, E. & Sammons, P. (2015). Effective pre-school, primary and secondary education project (EPPSE 3–16+). London: Department for Education. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/455670/RB455_Eff ective_pre-school_primary_and_secondary_education_project.pdf.pdf

The Teaching Council. (2020). *Céim: Standards for initial teacher education*. The Author. https://www.teachingcouncil.ie/en/news-events/latest-news/ceim-standards-for-initial-teacher-education.pdf

Tout, D. (2020). Critical connections between numeracy and mathematics. Supplementary materials. *Issues in the Teaching of Mathematics.* State of Victoria Department of Education and Training. https://research.acer.edu.au/cgi/viewcontent.cgi?article=1030&context=learning_processes

Twohill, A. (2020). *Algebra in the senior primary classes.* Commissioned research paper. National Council for Curriculum and Assessment. https://ncca.ie/media/4619/primary_maths_research_algebra_seniorclasses.pdf

United Nations Educational, Scientific and Cultural Organization. (UNESCO). (2021). Reimagining our futures together: A new social contract for education. Author. https://unesdoc.unesco.org/ark:/48223/pf0000379707.locale=en

United Nations (2015). Transforming our world: The 2030 Agenda for Sustainable Development. https://sdgs.un.org/goals

UNICEF (2019). *A world ready to learn: Prioritizing quality early childhood Education*. http://dx.doi.org/www.unicef.org/media/57926/file/A-world-ready-to-learn-advocacy-brief2019.pdf.

Victoria State Government. (2018). *Literacy and Numeracy Strategy. Phase 2. Achieving excellence and equity in literacy and numeracy*. Victoria State Government, Department of Education and Training. Accessed at: https://www.education.vic.gov.au/Documents/school/teachers/teachingresou rces/literacynumeracy/Literacy_and_Numeracy_Strategy_Phase_2.pdf

Weir, S., Kavanagh, L., Moran, E. & Ryan,A. *Partnership in DEIS schools: A survey of Home-School-Community Liaison coordinators in primary and post-primary schools in Ireland.* Dublin: Educational Research Centre. https://www.erc.ie/wp-content/uploads/2018/11/HSCL-report-2018.pdf

Weir., S. Errity, D. McAvinue, L. (2015). Factors associated with educational disadvantage in rural and urban areas. *The Irish Journal of Education*, *xl*, 94-110. https://www.erc.ie/documents/vol40chp6.pdf

Weir., S. & McAvinue, L. (2013). *The achievements and characteristics of students attending rural schools participating in DEIS.* Report to the Department of Education and Skills. Dublin: Educational Research Centre. https://www.erc.ie/documents/rural_report2013.pdf

Weir, S., & Denner, S. (2013). *The evaluation of the School Support Programme under DEIS: Changes in pupil achievement between 2007 and 2013.* Report to the Department of Education and Skills. Dublin: Educational Research Centre. https://www.erc.ie/documents/deis2013_bulletinreport.pdf

Weir, S., & Archer, P. (with O'Flaherty, A. & Gilleece, L. (2011). *A report on the first phase of the evaluation of DEIS.* Report to the Department of Education and Skills. Dublin: Educational Research Centre. https://www.erc.ie/documents/deis_p1_main.pdf

Weir, S., Archer, P., & Millar, D. (2009). *Educational disadvantage in primary schools in rural areas. Report No. 1: Analysis of English reading and mathematics achievement in schools in the rural dimension of the School Support Programme.* Report to the DES. Educational Research Centre. https://www.erc.ie/documents/educ_dis_primary_rural_report1.pdf

Weir, S. (2003). *The evaluation of Breaking the Cycle: A follow-up of the achievements of 6th class pupils in urban schools in 2003.* Report to the Department of Education and Science. Dublin: Educational Research Centre. http://www.erc.ie/documents/btcfollowuprpt03.pdf

What Works Clearing House. *Practice Guides for Educators.* Washington, DC: Institute of Education Sciences, U.S. Department of Education: https://ies.ed.gov/ncee/wwc/

White, H. (2019). The twenty-first century experimenting society: The four waves of the evidence revolution. *Palgrave Communications 5*, Article 47. https://doi.org/10.1057/s4159 9-019- 0253-6

Wickstrom, M. H. (2014). *An examination of teachers' perceptions and implementation of learning trajectory based professional development*. [Unpublished doctoral thesis]. Illinois State University. https://ir.library.illinoisstate.edu/etd/87/

Wigfield, A., Gladstone, J. R., & Turci, L. (2016). Beyond cognition: Reading motivation and reading comprehension. *Child Development Perspectives, 10*(3), 190–195. https://doi.org/10.1111/cdep.12184

Wixson, K.K., Valencia, S. W., Lipson, M.Y., Risko, V.J., Paratore, J., Reinking, D. & Hruby, G. J. (2020). *Children experiencing reading difficulties what we know and what we can do.* International Literacy Association, Literacy Leadership Brief. https://www.literacyworldwide.org/docs/default-source/where-we-stand/ila-children-experiencing-reading-difficulties.pdf

Part B: Summary of Systematic Reviews

Part B comprises summaries of each of the 27 systematic reviews on literacy, digital literacy and numeracy across early childhood, primary and post-primary conducted for the Department of Education tender. They provide an overview of key findings arising from the systematic reviews. The depth and richness of detail can be found in the complete papers which are footnoted at the start of each section.

Summaries are presented in the following order:

- B1: Pedagogical Strategies to Support Oral Language, Emergent Literacy, Literacy, Digital Literacy and Disciplinary Literacy Development
- B2: Pedagogical Strategies to Support Numeracy Development
- B3: Assessment to Support the Development of Literacy, Numeracy and Digital Literacy
- B4: Supporting Literacy, Numeracy and Digital Literacy Development of Diverse Learners
- B5: Continuous Professional Learning and/or Development
- B6: Enabling Family and Community Engagement

Note that references associated with each summary in Part B can be found in the associated report. links to the full papers are provided for ease of access.

Following the summaries, in Part C we have compiled the main evidence-based recommendations arising from the systematic reviews across the six pillars of the literacy, numeracy and digital literacy strategy. Not surprisingly, the majority of the recommendations fall within Pillar 4, Improving the Curriculum and the Learning Experience.

B1. Pedagogical Strategies to Support Oral Language, Emergent Literacy, Literacy, Digital Literacy and Disciplinary Literacy Development

Introduction

Extensive and detailed systematic reviews were conducted in relation to the pedagogical strategies that would support literacy and digital literacy development from early childhood to primary and post-primary. These reviews encompassed literacy and

digital literacy development in a variety of linguistic educational settings and learners from different sociolinguistic backgrounds. We also examined the development of disciplinary literacy across the curriculum.

The first section commences with a summary of the strategies for English language development across the age range from birth to senior cycle post-primary (B1.1 to B1.3)[27]. This is followed by strategies for Gaeilge as a first and second language, and learners for whom English is an additional language (EAL) (B1.4). The next section focuses on strategies for the development of digital literacy (B1.5). The final section in this part of the chapter deals with strategies for disciplinary literacy development across the curriculum (B1.6).

B1.1 Oral Language and Emergent Literacy in Early Childhood Education and Care[28]

Children are born primed to engage with people, to explore, learn and make meaning from the world around them (National Council for Curriculum & Assessment, (NCCA) 2009). Therefore, the experiences and relationships that children encounter in many different settings are of the utmost importance. This section of the review responds to the questions of what pedagogical strategies support children from birth to six in developing oral language and emergent literacy.

A promising link between children's experiences in play and literacy learning, in particular for vocabulary, language development and comprehension has been established (Rand & Morrow, 2021). Oral language development from birth to four years predicts reading comprehension in later years (Language and Reading Research Consortium & Chiu, 2018). The adult's role is important in engaging in play and providing a play environment (literacy props in thematic play areas, e.g., home corner, library). Time for children's play must be protected (Rand & Morrow, 2021).

In the context of preschool and school-aged children, studies on the specific (and broad) language skills that were affected by shared reading are inconclusive (Noble et al., 2019). However, longer shared reading interventions than in the studies in this

[27] Many of the recommendations for the development of English language apply equally to Irish language and EAL contexts. We did not make specific recommendations, however, unless we found such evidence in the systematic reviews.

[28] French, G., & Lake, G. (2022*). Pedagogical strategies to support oral language development and emergent literacy in early childhood education and care*. *A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881320

review, were recommended (Rogde et al., 2019) along with, smaller group size, contingent talk and child directed speech. Dialogic and shared reading interventions contain a lot of “language boosting ingredients” (Noble et al., 2019, p.8) with the adult modelling higher levels of syntactic and lexical diversity (Schickedanz & McGee, 2010). The style of dialogic reading is important, e.g., use of higher-order questions and targeting outcomes and vocabulary (Walsh & Hodge, 2018), developing conversations around books (Snow, 2017) and utilising culturally responsive texts (Lennox, 2013).

An ‘eco-behavioural’ model of language development which assumes that children learn language (and later literacy skills) through the opportunities afforded by adult-child interactions, involves the beliefs and skills of the adult, the resources, environment and government policies and practices which are distal influences on the timing, frequency, and quality of these interactions (Ford et al., 2018). Early vocalisations and babbling are important as a useful marker for children who are later identified as language impaired (Morgan & Wren, 2018). There is no convincing evidence that ‘baby sign’ enhances communication in typically developing infants who can hear (Fitzpatrick et al., 2014). What does make the difference is speech that is varied in words, syntactical structure and grammatical complexity (Zauche et al., 2016). However, directives that change the focus of a child’s attention have been found to have a negative impact on their language development (Topping et al., 2013).

Six-month-old babies are capable of making marks in their yoghurt on their highchair trays. From two years of age children create, express, imagine, and test hypotheses and understanding about their world through making marks on a page or a digital tablet (Neuman, 2022). Enhancing the quality of the environments and adult engagement within the context of authentic early writing experiences (Hall et al., 2015) and invented spelling facilitates young children’s early literacy development (Ouellette & Sénéchal, 2017; Albuquerque & Alves Martins, 2019).[29]

There is inconclusive evidence as to whether higher levels of educator education impact on academic, cognitive, social, and emotional outcomes for children (Falenchuk et al., 2017; Nocita et al., 2020). However, Brunsek et al. (2020) found positive associations were identified when child outcomes aligned with the content of professional learning and development programmes (e.g., in Language/Literacy PL).

[29] See French (2022) in B4.1 for further discussion on mark-making/emergent writing and invented spelling. https://doi.org/10.5281/zenodo.7881255

Markussen et al. (2017), Brunsek et al. (2020) and Ciesielski and Creaghead (2020) identified the following features of professional learning: tailored to the audience; embedded in the curriculum; multiple components of content, coaching, in practice feedback and communities of practice; and long duration. The importance of investment in professional learning was highlighted.

In summary, embedding language development in comprehensive, multi-component programmes that incorporate the key pedagogical strategies of: play, shared storybook reading, opportunities to communicate through mark making and emergent writing, and a mix of child and adult-initiated interactive activities can be effective in supporting young children's language and emergent literacy. The adult's role is critical, therefore the quality of the workforce and the importance of professional learning and development in the context of supporting language and emergent literacy is necessary.

B1.2 Literacy at Primary Level[30]

This section presents summaries of the systematic reviews focused on the cognitive and affective dimensions of literacy at primary level. Our reviews examined the research on effective pedagogies for the development of oral language, reading and writing development in the mainstream classroom. Further research on literacy development for children learning Gaeilge or English as an additional language can be found in section B1.3 below. Additionally, the needs of diverse learners are considered in section B.4 below and are addressed in papers B4.1-B4.9.

First, the role of oral language in supporting and mediating literacy development is highlighted. Second, development of key reading skills (phonological awareness, phonics, fluency, vocabulary, comprehension) is presented. Next, research on the development of writing skills and processes (composing/expressing, genre, grammar, spelling, handwriting) is summarised. Finally, the role of motivation, engagement and agency in influencing and mediating literacy development is highlighted.

[30] Kennedy, E., Concannon-Gibney, T., & Dwyer., B. (2022). *Pedagogical strategies, approaches and methodologies to support literacy in the primary school*. *A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881327

Oral Language Development and Integrated Literacy Instruction

Oral expressive language skills play a key supportive role in literacy development (Shiel et al., 2021; Snow, 2016; Dobinson & Dockrell, 2021) and in supporting learning across the curriculum (Alexander, 2013; Shiel et al., 2012). The quality of oral language has also been found to impact on social, emotional, and mental health at school (Benner et al., 2002; APPG, 2021), and to contribute to success in later life (Schoon et al., 2010) as it opens access to further education and employment. It is also key to engaged and agentic citizenship (APPG, 2021; Allington & McGill Franzen, 2021).

Oral language skills can be effectively developed within authentic literacy contexts (e.g., interactive book reading, literature discussion, writing processes and genres, inquiry-based learning, disciplinary literacy, critical literacy) through engagement in purposeful activities and should be supported by explicit intentional teaching linked to students' stage of development (Dobinson & Dockrell, 2021; EEF, 2021; Murphy et al., 2009; Wixson et al., 2020). Embedding oral language within such contexts supports children in developing a metalanguage to express their thoughts and responses while simultaneously supporting the development of key literacy skills (e.g., vocabulary, comprehension, composition). For example, in discussing and justifying the linguistic choices made in their writing, children develop knowledge of language components and how their word choices shape and alter meaning (Myhill & Watson, 2014). Additionally, literature discussions with strong student voice and agency have been found to be highly effective when a critical analytic stance is emphasised and a focus on higher-order comprehension skills is maintained. They are of most benefit to middle- and lower-achieving students and have been linked to gains in reading comprehension (Murphy et al., 2009).

Integrating the forms of language within lessons has strong support within the research literature (Graham, 2020; Graham et al. 2018a, 2018b). Balancing attention to reading and writing and embedding meaningful oral language into both is more effective than teaching these skills separately or as isolated decontextualized activities. Combining reading and writing instruction benefits skill development in both reading (word reading, fluency, vocabulary, comprehension) and writing (grammar, spelling, punctuation, expression across genres).

Opportunities for independent reading and writing also enhance literacy development and should complement explicit systematic classroom instruction in key literacy skills (Jouhar & Rupley, 2021). The success of integrated instruction is mediated by the level of professional development provided to teachers to plan and implement such instruction and the degree to which interventions are matched to curriculum and learners' current stage of development (Dobinson & Dockrell, 2021; EEF, 2021, Murphy et al., 2009).

Children need to experience a comprehensive, integrated approach to literacy instruction that is balanced in nature and which incorporates evidence-based explicit teaching of a range of key literacy skills including phonological awareness, phonics, morphology, vocabulary, oral reading fluency, comprehension, spelling, handwriting, and writing processes and genres and that gives due attention to the affective dimensions of literacy (Wixson et al., 2020; Graham et al., 2018a; Reynolds et al., 2011; Kennedy et al., 2012; Eurydice Report, 2011). It is important to note that the term 'balanced literacy' has vastly varying interpretations depending on jurisdiction. For example, in the US in recent times, it has become a politicised and contested term which has reignited the 'reading wars' in the debate around the *science of reading*, as 'balanced literacy' is interpreted by some to mean insufficient attention is paid to the explicit and systematic teaching of key foundational early literacy skills necessary for successful reading. In the UK, on the other hand, Wyse and Bradbury (2022) have called for a more balanced approach to literacy instruction given the over-emphasis on synthetic phonics approaches to word reading in UK curricula and policy. Based on our reviews of the literature, we interpret balanced literacy to mean: balanced in terms of attention to systematic research-informed explicit teaching of constrained skills (e.g., phonics, letter knowledge, punctuation) and unconstrained skills (vocabulary, comprehension composition) according to children's assessed needs and stage of development; balanced in terms of access to a wide variety of genres and 'texts' in reading and writing; balanced in terms of formative and summative assessment practices to inform teaching; and balanced in terms of attention to oral language, reading and writing recognising the reciprocal relationship and supportive processes existing between the forms of language. This means that a teacher must attend to both the explicit and systematic teaching of code-based skills (e.g., phonics) with the provision of meaningful opportunities to apply these skills when reading connected texts (connected texts are meaningful texts with multiple related sentences

characterised by a coherent and cohesive structure) and when creating texts in a variety of genres and disciplines). The key tenets of the science of reading – that children require evidence-informed, systematic and structured teaching in essential literacy skills – should be reflected in high-quality literacy pedagogy. This includes the scaffolded application of these skills in appropriately challenging texts. The evidence on these crucial components of literacy instruction (e.g., phonics, phonological awareness) are addressed in detail in the accompanying systematic reviews.

Development of Component Reading Skills

Phonological awareness and alphabet knowledge must be explicitly taught in a systematic manner in the early years of school in accordance with assessed needs, including the segmentation of syllables, onset-rimes, and phonemes in spoken words and how these units of sound correspond to letters (Eurydice Report, 2011; Foorman et al., 2016; Invernizzi & Tortorelli, 2013; Reynolds et al., 2011; Kennedy et al., 2012). Interventions that used teacher read-alouds of storybooks have been found to enhance children's phonological awareness (Swanson et al., 2011). Instruction in phonemic awareness is most effective when combined with letter manipulation and when children are taught in small groups for a limited time (20 hours) (Foorman et al., 2016; Invernizzi & Tortorelli, 2013; Reynolds et al., 2011; NICHHD, 2000). Additional instruction should be directly linked to the structured teaching of phonics and spelling (Invernizzi & Tortorelli, 2013).

Nevo et al.'s (2018) interactive storybook-reading intervention programme, which was delivered by kindergarten teachers to 30 Hebrew-speaking kindergarten children, showed improvements for the intervention group in vocabulary, morphology, phonological awareness and print concepts on language and print-concept skills. Nicolopoulou et al.'s (2015) study in the USA facilitated children acting out and sharing/telling their own stories. Repeated sharing of children's own stories with groups increased narrative comprehension and some emergent literacy skills (phonological awareness, syllable and word awareness). Thus, the way the book is shared and the activities that follow are important supports for language development and must be developmentally appropriate.

It is important that teachers adopt a systematic approach to phonics instruction for younger readers that emphasises sound-spelling patterns, morphological elements of words and the interrelation between phonology, morphology and etymology (Ehri,

2020; Eurydice, 2011; Reynolds et al., 2011; Torgerson et al., 2019). Invented spelling can be a useful tool in developing phonemic awareness, which is essential in learning to decode and encode (Ouellette & Sénéchal, 2017). As highlighted in Kennedy et al. (2012, citing Gentry, 2000; Ehri, 1993), the process of *writing* words (encoding) and the process of *reading* words (decoding) draws upon the same underlying base of word knowledge. The more pupils know about the structure of words (including their spelling) the more efficient and fluent their reading will be. Thus, 'spelling knowledge can be viewed as a driving force behind efficient reading as well as efficient writing' (Kennedy et al., 2012, p.67).

Phonics should form part of a total reading programme that is balanced, with instruction that focuses on aspects of reading for meaning (Bowers, 2020; Eurydice, 2011; Reynolds et al., 2011; Wyse & Bradbury, 2022). Struggling readers can benefit from experiencing small group phonics instruction (Eurydice, 2011). Morphology instruction has also been found to be beneficial in supporting literacy achievement, as it can lead to enhanced performance in relation to decoding, phonological awareness, spelling and vocabulary (Goodwin & Ahn, 2013; Sedgwick & Stothard, 2018).

There should be a sustained emphasis on the development of vocabulary throughout primary school (Cregan, 2019). It is helpful if instruction incorporates direct instruction and implicit exposure to new vocabulary, including academic vocabulary (Foorman et al., 2016; Hattie, 2009; Reynolds et al., 2011). Children need to have multiple encounters with target vocabulary across different contexts and will benefit from explicit teaching that incorporates contextual analysis, morphemic analysis and semantic analysis (Hairrell et al., 2011; Sedgwick & Stothard, 2018; Wright & Cervetti, 2016). Multi-sensory and multi-modal techniques can help to anchor word knowledge (Lawson-Adams & Dickinson, 2020; Rowe et al., 2013; Tellier, 2008). It may be helpful to teach pupils multiple and flexible strategies for solving word meanings in order to enhance their comprehension (Wright & Cervetti, 2016).

Interactive book reading has been found to aid the development of vocabulary through high-quality discussion, extended vocabulary activities and repeated reading of well-chosen texts (Swanson et al, 2011; Wasik et al., 2016). These lessons can be further enhanced if instruction incorporates phonics, morphological awareness and phonological and orthographic tasks in follow-up activities (Sedgwick & Stothard, 2018). The use of challenging, inferential and extra-textual talk during shared reading

lessons with young children has been found to be particularly beneficial (Dickinson & Porche, 2011; Zucker et al., 2013).

Oral reading fluency can be enhanced through repeated readings that are guided by the teacher (Hudson et al., 2020; Rasinski et al., 2009; Reynolds et al., 2011). Approaches that incorporate repeated readings include paired reading, assisted reading, phrase reading, radio reading, 'the oral recitation lesson' (ORL), 'fluency development lessons' (FDLs), 'fluency orientated reading instruction' (FORI), and Fast Start (Eurydice, 2011; Kennedy et al., 2012; Nichols et al., 2009; Rasinski et al., 2009). Instructional level texts are deemed useful in enabling students to practise accurate decoding and encoding, and rereading the texts can build oral reading fluency, particularly in intervention settings (Foorman et al., 2016). Children need to read connected text every day to become fluent readers. Oral reading fluency interventions have also been found to enhance reading comprehension achievement (Hudson et al., 2020).

Good readers orchestrate a repertoire of strategies as they read and these strategies can be taught in classrooms to increase reading comprehension (Clinton et al., 2020; Davoudi & Sadeghi, 2015; Elleman, 2017). Teachers should teach students a range of comprehension strategies that will help them construct meaning from text while concurrently teaching and developing metacognition and supporting students to become independent self-regulated readers. Explicit or formal instruction of reading comprehension strategies by the teacher involves demonstrating, modelling, and guiding the reader to use these strategies independently when reading (Davis, 2013; Reynolds, 2017). Teachers should choose texts that support their teaching goals and improve reading comprehension (Shanahan et al., 2010). Students construct meaning from text when taught the structure of both narrative and informational (including expository) texts (Ray & Meyer, 2020; Shanahan et al., 2010). In addition, there are strong reciprocal relationships between the prior or background knowledge a reader brings to the text and the reader's ability to construct a coherent model when comprehending a text (Fielding & Pearson, 1994). Readers draw on prior or background knowledge, in an active metacognitive fashion, to make connections, determine importance, make inferences, monitor and repair comprehension, and derive summaries. Research suggests (Smith et al., 2021) that low skilled readers who have strong prior or background knowledge of a subject can compensate, to some extent,

for poor reading skills. This is dependent on the coherence and cohesion of the text structure.

Students with limited vocabulary knowledge can encounter difficulties with reading comprehension because vocabulary is an essential enabler of reading comprehension development. Integrating literacy and content area instruction enhances both vocabulary and comprehension while concurrently developing content area knowledge throughout the primary school system (Hwang et al, 2021).

Development of Component Writing Skills

Writing is a complex problem-solving process (McCutchen, Teske, & Bankston, 2008) and depends, at least in part, on the writer's understanding of and experience with the writing process and with the various skills involved in composing a text. The capacity to write well is fundamental to success in school and supports future learning of more complex knowledge, which in turn supports individuals in discovering and reaching their potential in life (Graham, 2019; Kennedy & Shiel, 2019). In line with UNESCO (2021), Camacho et al. (2021, p.214) consider writing to be 'a key skill in the twenty-first century and a gateway to lifelong learning, employment, and social inclusion'. Writing also provides the means for 'personal reflection, thought, creativity, creation of meaning and exchange of ideas, as well as a complement to other modes of communication in a world of multimodal texts' (Patino et al., 2020, p. 494). Writing development is influenced by the 'affordances of classrooms which can either constrain and hinder it or propel it forward' (Kennedy & Shiel, 2022, p.1). A common theme across research studies on writing is the provision of sufficient daily time for students to write using a range of modes (written, multimodal, digital) in a range of genres for real purposes and audiences (Graham et al., 2012a, 2012b; Graham 2019). Daily time to write on self-chosen topics within authentic contexts and opportunities to share writing with an audience is linked to writer motivation, creativity, agency and identity (Vaughn 2020; Camacho et al., 2021; Limpo & Graham, 2020). It is necessary for teachers to provide systematic incremental explicit instruction on the crafts, processes and conventions of writing if children's writing quality and accuracy is to be optimised (Graham et al., 2012a, 2012b; McMaster et al. 2018; Koster et al., 2015; Graham et al., 2015; Graham, 2019; Kennedy et al., 2012; Kennedy & Shiel, 2019).

Process-based approaches to writing have been found to be effective in supporting students as writers across multiple genres (Graves, 1994; Graham &

Sandmel, 2011). They are most effective when explicit mini-lessons in genre-specific crafts, processes and conventions of writing are taught using self-regulated strategy instruction and include goal setting which in turn supports development of children's metacognition (McMaster et al., 2018; Koster et al., 2015; Graham et al., 2012a, 2012b; Graham, 2019). It is important that teaching is adequately balanced between the lower and higher-order dimensions of writing as research indicates that higher-order dimensions are often neglected (Graham et al., 2012a; Kennedy et al., 2012; Kennedy & Shiel, 2019).

A key feature of process-based approaches to writing is writer support while writing which includes teacher feedback in conferences and opportunities for students to collaborate with peers. Teacher modelling of how to give and receive feedback has been found to support students in peer and self-assessment and to impact positively on the quality of writing (Slavin et al., 2019; Kennedy & Shiel, 2019; Graham et al., 2011; Graham et al., 2012a; Graham et al., 2015).

There are conflicting findings on the role of grammar in writing pedagogy and its potential to impact on writing quality. Its potential to impact writing quality depends on how it is conceptualised and presented in curricula, the extent to which it is taught in isolation 'as an arbiter of accuracy' (Myhill & Watson, 2014, p.45) or is taught within the context of authentic writing where it can be utilised as a design tool for communicating. Early meta-analyses (cited in Graham et al., 2012a) concluded that grammar teaching in isolation has little or no effect on students' writing (Hillocks and Smith, 1991) or a negative effect on it (Braddock et al., 1963). More recently, Graham & Perin (2007, cited in Graham 2012a) and Koster et al. (2015) also found negative effects of systematic teaching of the parts of speech and structure of sentences on writing quality. However, when conceptualised as a design tool and attention paid to the lexical, syntactical and rhetorical dimensions within authentic writing contexts, it has been found to be effective in raising the quality of writing (Myhill & Watson 2014; Kennedy & Shiel, 2022).

Spelling is an integral part of the orthographic knowledge that underlies efficient, automatic generation of words during writing (encoding), and efficient, automatic perception of words during reading (Kennedy et al., 2012; Ouellette & Sénéchal, 2017). Including formal systematic and explicit spelling instruction as part of a balanced literacy framework has been found to support students as writers and frees up the

cognitive resources needed for the higher-order processes of writing (Graham & Santangelo, 2014; McMaster 2018; Kent & Wanzek, 2016). As noted above, providing opportunities for young children to compose using invented spelling has been found to not only benefit writing processes but has also been identified as playing a causal role in later proficient reading development (Ouellette & Sénéchal, 2017; Kennedy et al., 2012) and supports children in acquiring the alphabetic principle.

Like spelling, explicit attention to handwriting has been shown to impact positively on writing development and quality (McMaster et al., 2018; Fancher et al., 2018) and writer self-efficacy as it frees up cognitive resources, allowing the writer to concentrate on ideas, language choice, genre and expression (Santangelo & Graham, 2016; Feng et al., 2019). A range of interventions have been found to be effective in improving handwriting skills in children up to 9th grade (equivalent to Junior Cycle in Ireland). In designing an intervention, writing should be assessed for legibility, fluency, accuracy and speed (Patino et al., 2020; Graham et al., 2012; Dwyer et al., 2022). Handwriting practice should be distributed over time (e.g.,10 minutes daily) and 10 hours is sufficient for most students to master handwriting (Santangelo & Graham, 2016; Limpo & Graham 2020).

Research highlights the important role of handwriting in linking letter names and sounds and has been found to be even more effective than tracing or passively viewing a letter (Fancher et al., 2018). Mayer et al. (2020) note the proliferation of digital writing devices in primary classrooms which increasingly replace handwriting with pencil and paper. Their small-scale study examined differences in literacy skill acquisition at the letter and word level among kindergarten children who received three different approaches to handwriting. Across 7 weeks children were trained with 16 letters by handwriting with (a) a pencil on a sheet of paper; (b) by writing with a stylus on a tablet computer; (c) or by typing letters using a virtual keyboard on a tablet. Results revealed that handwriting with a pencil fostered better acquisition of letter knowledge and improved visuo-spatial skills compared with keyboarding. The pencil and paper and keyboard groups had higher performance in word writing and reading compared with the stylus group. Writing with a stylus on a touchscreen was deemed least satisfactory (perhaps due to greater demands on motor control).

Though learning to touch type is an important life skill and students should have the opportunity to learn it, it should not replace handwriting instruction (Graham et al.,

2012a; Feng et al. 2019). While meta-analyses did not examine the optimum age at which children should learn to touch type, in countries where keyboarding skills are indicated in national curricula, they first appear in third grade when children have developed greater manual dexterity and their hands can span the keyboard. For example, the Common Core State Standards in the US, keyboarding appears in the writing standards for third grade students when publishing. By fourth grade, students must "demonstrate sufficient command of keyboarding skills to type a minimum of one page in a single sitting" (CCSS, 2016, p. 21) and two pages by fifth grade. Feng et al. (2019) explored the associations between handwriting or keyboarding on writing quality across 19 studies involving students from kindergarten to adolescence. Findings confirmed previous studies (e.g., Graham et al., 2012a, 2012b; Limpo & Graham, 2020; Kent & Wanzek, 2016) that handwriting fluency is a significant predictor of student performance in relation to writing compositional quality, fluency and substantive quality. Students with better handwriting fluency also had better keyboarding fluency indicating a significant correlation between both operations. In the Irish context e-PIRLS 2016 data suggested that less than half (47%) of Fourth-class pupils agreed a lot that they were good at typing (Eivers & Delaney, 2018). Overall, though there are too few studies comparing keyboarding skills with handwriting skills on compositional writing quality (Graham et al., 2012a; Feng et al., 2019), students should be taught to type (Graham et al. 2012a) and third or fourth grade appears to be a good age to build such skills systematically in developmentally appropriate ways (Donika et al., 2018).

Key Role of Motivation and Engagement in Literacy Development

Motivation for reading accounts for variance in reading performance beyond academic or cognitive skills (Toste et al., 2020; Wigfield, Gladstone, Turci, 2016). Teachers should examine ways in which school contexts provide spaces for the development of agency and in turn engagement and motivation (Vaughn et al., 2020). Instructional practices that allow students to construct identities as readers, develop positive dispositions towards reading, that involve and encourage dialogue, critical engagement and privilege student choice in terms of materials and resources should be considered (Vaughn et al., 2020; Murphy et al., 2009; EEF, 2021). Gender differences are noted by Wigfield et al. (2016) with girls more positively motivated to read than boys. The authors suggest that educators adopt measures to improve male students' competence beliefs and the value placed on reading. These include providing

informative feedback; setting challenging but achievable tasks; the promotion of active learning goals, and the creation of regular opportunities for students to promote what they are reading through book talks (Barber et al., 2018).

Writing development is influenced by writer motivation, engagement and agency (Camacho et al. 2021; Vaughn et al., 2020). These affective dimensions of writing can be supported by providing students with the kinds of experiences e.g., social persuasion, vicarious and mastery experiences that build their confidence and success with writing (Bandura, 1995; Kennedy & Shiel, 2019). Creating conditions for an engaged community of writers to develop in the classroom supports students to view themselves as writers (Graham et al., 2012a; Kennedy & Shiel, 2019).

As highlighted earlier, oral expressive language skills play a key supportive role in literacy development (EEF, 2021; Shiel et al., 2012). They are strongly correlated with levels of print exposure (Mol & Bus, 2011) and are important in cultivating positive dispositions towards literacy. They can be developed within authentic literacy contexts (e.g., interactive book reading, literature discussion, writing processes, disciplinary literacy and cross curricular contexts (Kennedy et al., 2012; Alexander, 2013; Shiel et al., 2012; Dobinson & Dockrell; Snow 2016). Book discussions provide a motivating context for students to articulate text interpretation in responding to culturally responsive and engaging texts linked to their interests and stage of development. High-quality literature discussions which emphasise a critical analytic stance and a focus on higher-order comprehension skills support strong student voice and agency (Murphy et al., 2009; Soter et al., 2008). In writing, providing an audience for authors through daily share sessions enhances engagement as authors receive timely feedback from peers and teachers. Additionally, when oral language permeates daily share sessions, it cultivates positive writer identities and enhances students' understanding of writing as a social and communicative act (Graham et al., 2012a; Kennedy & Shiel, 2019).

B1.3 Pedagogical Strategies for Literacy Development at Post-primary Level[31]

This section should be read in conjunction with the sections on primary-level literacy (B1.2), digital literacy (B1.4) and disciplinary literacy (B1.5). Those sections are

[31] McDonald, E., Doyle, A., Fitzsimons, S., & White, I. (2022). *Pedagogical strategies to support literacy development at post-primary level. A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881330

also relevant to post-primary students, with many activities designed for upper-primary students also suitable for those in lower secondary.

Reynolds (2020) highlights five ‘anchor literacy constructs’ for adolescent literacy development: vocabulary, comprehension, discussion, motivation and intervention, and recommends that this list should be expanded to include text selection and text complexity, digital literacy, disciplinary literacy, and the integration of reading with writing.

Vocabulary knowledge is critically important for reading comprehension ((Joshi, 2006; Kame’enui & Baumann, 2012), as is a related construct, background or prior knowledge. While adolescents will acquire much of their background knowledge informally (for example, through engaging in silent reading of texts), they will also need instruction on key words and concepts (sometimes known as Tier 3 vocabulary, Beck et al., 2002, 2008), both in language and in other subject areas. Instruction in vocabulary should promote students’ understanding of word meanings, and their ability to use those words in different contexts (oral language, reading, writing, multimodal presentations) (Moje, 2015). As students develop academic language, attention will need to be allocated to understanding the syntactic and discourse constructions in which the words are employed. Uccelli’s (2015) Core Academic Language Skills (CORE) framework, which includes unpacking complex words and sentences, and recognising academic registers, is relevant to this. Another key element of vocabulary development is students’ appreciation of an author’s use of language, including word choice and figurative language (DE, 2017).

There is now strong evidence to support the development of reading comprehension skills – both print-based and digital – among adolescents, especially those struggling with reading in at-risk groups, who may benefit from explicit instruction (Filderman et al., 2021). Adolescent readers must be able to engage in analysing, synthesising, connecting and integrating disparate material, across multiple sources and evaluate whether the various sources are consistent. In attending to this task, readers must adopt an active, critical, questioning stance while reading (Goldman, 2012). The Junior Cycle specification for English (DE, 2017) refers to such skills as retrieving information, following a process or argument, summarising, linking main ideas, monitoring understanding, questioning, analysing, synthesising and evaluating. In addition, reference is made to identifying, appreciating, and comparing how different

literary, digital and visual genres and subgenres shape the reader's experience. The list in the specification can be supplemented with digital-specific skills such as identifying search terms, determining the credibility of texts, consolidating information and keeping track of sources (Brun-Mercer, 2019; Goldman, 2012), as well as a range of web-related strategies (Harris, 2015). In PISA 2018, just 44% of 15-year-olds in Ireland reported that they had been taught how to use keywords when using a search engine, fewer than half (46%) reported that they had been taught how to compare web pages and decide which information is relevant to their schoolwork. Such skills are relevant in language classes and across disciplines. Whether skills are taught explicitly individually or in combination, it is important to ensure that students develop some degree of independence in applying them. Reynolds (2020) called for differentiating the skills taught to adolescents at different age levels.

A major concern arising from analyses of PISA 2018 data for Ireland is the decline in the proportion of 15-year-olds reading for enjoyment, with the proportion engaging in no reading at all at 47.7%, compared with 41.9% in 2009. Related to this, in 2018, 56.1% of boys and 39.4% of girls reported that they did not read for enjoyment at all (Shiel et al., 2022). These data are disappointing, given the documented benefits of reading for enjoyment on academic performance (literacy and thinking skills), social engagement, personal development, and the insights students gain into mature relationships, personal values, cultural identity, physical safety and security, aesthetic preferences and understanding of the physical world (Howard, 2011). Wilkinson et al. (2020) reported that adolescents who read print books for pleasure developed empathy skills and discussed their reading with others. They called for collaborative work among researchers, teachers and engaged and disengaged readers to ensure that initiatives for promoting reading are optimal and resonate with their intended audience. Similarly, Barber and Klauda (2020, p.32) highlighted the importance of "gaining knowledge of students' reading proclivities and interests" as a critical step in building motivation and engagement support in classrooms, arguing that this is a key to promoting self-efficacy and intrinsic motivation. Quinn and Somers (2006) have provided useful guidance on implementing reading for enjoyment programmes in school settings in Ireland. Building on this, there is a need for a sustained, focused strategy to foster and promote reading and attitudes towards reading, appropriate to the evolving nature of reading.

There is good research evidence to support the integration of reading and writing in literacy programmes at post-primary level (e.g., Graham et al.'s 2018 meta-analysis). Students should be supported in developing their writing skills through instruction in implementing pre-writing activities, using a process writing approach (planning, writing and editing texts), studying models of writing, combining sentences, word processing, writing collaboratively and summarising (Graham & Perin, 2007; Kennedy & Shiel, 2019). Attention should also be given to applying these skills in the disciplines as well as in language classes. Baye et al. (2019) noted that learning to write may help adolescents gain insights into the structure of texts, as they learn authors' strategies for communicating with readers.

Interventions for at-risk adolescents are most effective if they include attention to building background knowledge and reading comprehension strategies rather than decoding, though attention needs to be given to the ability and knowledge of students, the features of a text, and instructional goals for the lesson in selecting appropriate approaches to comprehension intervention (Filderman et al., 2022). There is also value in focusing on interventions that incorporate the opportunity for students to preview the text with a model of good reading (e.g., an adult reader or audiotape reading of the text). Students make more gains in reading rate than students who do not preview the text or preview the text silently or on their own (e.g., Skinner et al., 1997).

Recognising and understanding the needs of post-primary students in terms of their literacy development is important for the success of literacy programmes and the NLNS. Literacy attainment and achievement of post-primary students, needs to move beyond the text-based model that is concerned with simply decoding words and extracting information to one where students build *situational* models around the texts they read (Kintsch, 2004; Goldman et al., 2012, 2016). Thus, any intervention to support reading needs to focus "not only on decoding and understanding words and sentences but also on link-making and the activation of students' life experiences and perspectives" (Paul & Clark, 2016, p. 117).

B1.4 Literacy Development for Gaeilge and English as an Additional Language[32]

This section of the report summarises the findings in relation to literacy development for Gaeilge and English as an additional language.

B1.4.1 Literacy Development – Gaeilge

Student engagement in meaningful oral language, reading and writing in a variety of genres in Irish, making explicit links between the reading and the writing process, has proved effective (DES, 2016b; Fitzpatrick et al., 2018; Hickey & Stenson, 2017; Al-hajji & Shuqair, 2014; Ní Mhaonaigh, 2013, 2017). Task based language teaching and Content and Language Integrated Learning (CLIL) incorporated into the teaching of Irish and communicative language teaching should be balanced with analytical approaches to teaching (Fitzpatrick et al., 2018; Gil-López et al., 2021; Graham et al., 2018; Harris & Ó Duibhir, 2011; Hood, 2020; Ioannou-Georgiou et al., 2011). Explicit teaching of grammar in context, using deductive and inductive approaches, is particularly warranted for learners when there is limited use of the target language outside of school (Fitzpatrick et al., 2018; Goo et al., 2015; Kang et al., 2018). Immersion education programmes have been shown to be very effective in producing biliterate bilingual minority language speakers (Fitzpatrick et al., 2018; Genesee, 2022; Ó Duibhir, 2018; Wilson et al, 2022). This finding applies to learners with diverse learning needs (Genesee, 2022) and from all social backgrounds (Ní Chlochasaigh et al., 2021). Increasing the numbers of students attending Irish-medium schools from the current 8% at primary and 4% at post-primary would generate a greater number of active bilingual speakers in society. Students should be exposed to a wide range of books and texts including digital books to support bi-pluriliteracy. All parents should be encouraged to read in Irish to their children and this could be supported by technology. Information/expository texts are especially beneficial for vocabulary development in the L2. Big books are a very valuable resource for shared reading and should focus on the specific language needs of L2 learners (Mhic Mhathúna, 2010; Wang, 2011). Glossed reading with careful use of L1 may support reading in Irish (Yanagisawa et al., 2020; Ramezanali et al., 2021). Students should engage in the writing process and have opportunities to write collaboratively in Irish which allows for negotiation of both

[32] Concannon-Gibney, T., de Brún, J., Ní Dhiorbháin, A., Ní Láimhín, M., Ó Duibhir, P. (2022). *Pedagogical strategies, approaches and methodologies to support literacy and digital literacy development for Gaeilge and EAL*. *A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881298

meaning and form, and opportunities to discuss language (Elabdali, 2021; Lu & Kim, 2021). Texts for group and individual reading have benefits for extensive reading for L2 readers when texts are at a suitable level.

Students should learn spelling rules in Irish and compare word patterns in Irish with English and other languages (DES, 2016b; Stenson & Hickey, 2019). Irish is a morphologically rich language and more emphasis on the morphology of Irish in teaching and learning could prove beneficial (Barnes, 2017). Teachers should assess spelling regularly on a termly basis by administering a developmental spelling test which can provide qualitative information about students' orthographic knowledge (DES, 2016b). Weekly spelling tests, on the other hand, do not support differentiated learning and teachers should assess spelling in sentences and written work and focus on teaching spelling rules and patterns in words (DES, 2016b; Stenson & Hickey, 2019).

Teacher competency and exposure to L2 are critical factors in effective language teaching. Teachers' Irish qualifications, including CLIL, should be embedded in the Common European Framework of Reference for Languages (CEFR) (Fitzpatrick et al., 2018; Gallagher & Ní Mhaonaigh, 2009; Marsh et al., 2011; Ní Dhiorbháin & Ó Duibhir, 2021). Professional development and teacher education should focus on teachers' linguistic knowledge in Irish as well as their pedagogical content knowledge, including transfer of skills across languages (Ní Dhiorbháin & Ó Duibhir, 2021; Ní Mhaonaigh, 2013, 2017; Ó Ceallaigh et al., 2017; Ó Ceallaigh et al., 2019. CLIL and Irish-medium teachers need support in integrating language with content through successful pedagogy (Tedick & Lyster, 2020; Ó Ceallaigh et al., 2017; Ó Ceallaigh et al., 2019).

School leaders play a key role in effective language learning by, (i) fostering a plurilingual approach to students' learning in Irish, English, home and foreign languages, (ii) promoting the informal use of Irish and CLIL in L2 settings, (iii) adopting a whole school approach in Irish-medium settings to support students' social and academic use of Irish and forging links between schools, community and homes (DES, 2016a; Ó Ceallaigh & Ní Shéaghadha 2017).

Flipped learning where learners engage with content before class may enhance students' learning of Irish. Teachers should promote self-directed and autonomous learning in Irish (Bond, 2020; Vitta & Al-Hoorie, 2020). Computer assisted language

learning (CALL), mobile assisted language learning (MALL), digital game-based language learning (DGBLL), have been effective in improving the L2 learning experience and outcomes (Burston, 2015; Cheng et al., 2020; Fu, 2018; Lin & Lin, 2019; Peng et al., 2020; Persson, 2018; Sung et al., 2015). Digital resources with clear language learning goals should be developed and carefully implemented in the context of Irish.

Students with additional needs should not be excluded from learning Irish (Genesee, 2022; Sparks, 2016; von Hagen et al., 2021). Teaching, learning and assessment should be differentiated to support all students in learning Irish in an inclusive fashion (Nic Aindriú, 2021). Rote learning for examinations in Irish at secondary level should be discouraged (Nic Eoin, 2017; Ní Mhaonaigh, 2013; 2017; Ó Curraoin, 2017; Ó Laoire, 2017). Oral and written assessments should be revised to encourage students to use their communicative language skills and assessment should be embedded in the CEFR. Students who are bilingual should be assessed bilingually and early intervention should not be delayed (Barnes, 2017; Genesee, 2022; Mhic Aoidh, 2017).

B1.4.2 Literacy Development – Learners of English as an Additional Language

A positive plurilingual environment in schools and classrooms can enhance EAL learners' English language proficiency. It is helpful to make significant use of translanguaging in lessons and across the school day. The teaching that EAL pupils encounter in the classroom should take account of the cultural knowledge and lived experiences that they bring to the classroom (Cole, 2013; Dixon et al., 2012; Jun, 2013; Kirwan & Little, 2021; Mallows, 2012; Melby-Verlag, 2011).

Metacognitive strategies and specific language learning strategies are an important part of EAL instruction. Strategy instruction is most effective when it is used at a low-intensity level for longer periods and has the most significant impact on speaking skills (Alsowat, 2020; Ardvasheva et al., 2017; Jun, 2013; Plonsky, 2011).

Peer supported social learning contexts are effective in enhancing EAL pupils' English language proficiency. The use of unsegregated environments where EAL pupils receive support while working with native speaking peers in collaborative contexts to build understanding are recommended (Adescope et al., 2011; Bowman-Perrott et al., 2016; Cole, 2013; Pyle et al, 2017; Sutter, 2012). Digital tools can be

used in this context to promote interaction, communication and problem-solving amongst pupils (Macaro et al., 2012; Parmaxi, 2020; Pinto et al., 2012).

Explicit vocabulary instruction and targeted oral language practice has been found to yield language gains for EAL learners. However, explicit word learning is most effective when complemented with implicit word learning strategies and opportunities to encounter new vocabulary in a variety of contexts to ensure repeated exposure (August, McCardle & Shanahan, 2014). Variety in instructional activities was deemed a key aspect of effective vocabulary instruction. Approaches that included non-verbal supports such as gestures, pictures and sounds or the use of digital tools were found to be helpful in enhancing vocabulary knowledge (Lawson-Adams & Dickenson, 2019; Proctor et al., 2005; Webb & Nation, 2017; Uchichara, Webb & Yanagisawa, 2019). Grammar knowledge is best developed through a combination of explicit and implicit approaches, with the most attention given to implicit teaching (Kang, Sok & Han, 2019). The use of recasts in grammar instruction are helpful when used in conjunction with other techniques (Miller, Chamness & Wei, 2012). Task-based learning was found to be more effective than more traditional grammar activities (Bryfonski & McKay, 2019). Digital tools can be effective in the context of task-based learning to enhance vocabulary and grammar (Persson & Nouri, 2018). The quality of teacher talk is a critical variable in EAL language instruction. It is recommended that teacher talk be comprehensible to EAL pupils through slowing the pace of speaking, differentiating vocabulary used and maximising the opportunities for pupil talk and interaction in lessons (Cregan, 2019; Delcenserie et al., 2019; Justice et al., 2018; Ó Duibhir & Cummins, 2012; Pang, 2019).

EAL pupils can learn to read and write in English before reaching a threshold of English oral language proficiency level so instruction should integrate reading, writing, speaking and listening from the beginning (Jun, 2013; Ludwig, Guo & Georgiou, 2019). Interventions that include multiple components are most effective in enhancing reading proficiency with the exception of vocabulary which can be beneficial as a separate, targeted intervention (Silverman et al., 2020; Snyder, Witmer & Schmitt, 2017). EAL pupils benefit from explicit instruction in phonological awareness, phonics, vocabulary, oral reading fluency, reading comprehension and morphology (August, McCardle & Shanahan, 2013; Goodwin & Ahn, 2013). In intervention settings, pupils benefit from small-group instruction that is formed according to instructional needs. Extensive

reading and shared reading are recommended for improving reading outcomes of EAL pupils (Baker et al, 2014; Ludwig et al, 2019).

Reading and writing have a reciprocal relationship that should be emphasised in teaching EAL pupils. Feedback is an important element of writing instruction for EAL pupils, with written feedback being particularly helpful in enhancing writing development (Biber et al., 2011; August et al., 2014). Collaborative writing practices that are combined with explicit teacher instruction have been found to increase EAL writing achievement (August et al., 2013; Lu & Kim, 2020). Traditional writing practices can be combined with digital multimodal composition for the benefit of EAL pupils' writing proficiency (Smith, 2021).

B1.5 Digital Literacy: Pedagogical Strategies, Approaches and Methodologies to Support Digital Literacy Development[33]

Digital literacy is a deictic rather than a static construct that is constantly evolving. Being digitally literate involves our students in socially situated practices supported by skills, strategies, stances, social practices, and dispositions that enable knowledge development and learning, and the generation, representation and understanding of ideas using digital tools (Dwyer, 2013; Leu et al., 2018).

Digital literacy is underpinned by a range of theoretical perspectives (Cope & Kalantzis, 2000; Kress, 2003; 2010; Lankshear & Knobel, 2003; Leu et al.,2004; Pahl & Rowsell, 2005; The New London Group, 2000).

In classrooms, practice should be underpinned and grounded in research (Bradley & Reinking, 2011). Research should move beyond the novelty of technology use in classrooms, to consider the social context along with the *why* and *when* of how technology could be used to support literacy and learning. Teachers must consider curriculum goals and learning outcomes for students before considering the meaningful use of technology to enhance literacy and learning in the classroom (Mishra & Koehler, 2006; OECD, 2017)

Issues of equality of opportunity, excellence in instruction, social inclusion, and social justice should underpin all that we do to ensure that all students, regardless of

[33] Dwyer, B., Leahy, M., Donlon, E., Giblin, F., & O'Neill, S. (2022). *Pedagogical strategies to support digital literacy. A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7882183

ethnicity, age, geographical location, class, gender or socio-economic status (SES), have equitable and quality access to digital technologies for literacy and learning in classrooms, homes and communities (Martínez-Bravo et al., 2020; Rybakova et al,.2019; Scheerder et al., 2017).

Online reading skills are built on foundational print-based skills, but reading is more complex in an online environment (Dwyer, 2020). The way in which every-day literacy practices and communication have been transformed by technology require teachers to consider their role in advocating for the appropriate use of technology with young children, pupils and adolescents, and the optimal use of digital technology in classroom and ECEC settings (Herodotou, 2018; Hsin et al., 2014; Zheng et al., 2016).

Screens cannot replace interactions with an adult when reading, but multimedia books have a positive impact on children's learning when compared to children reading alone (Takacs et al., 2014; 2015). Features of multimedia stories can have positive or negative effects and digital enhancements must be related to the story and relate to children's interests (Takacs, Swart, & Bus, 2015).

Students' attitudes towards technology usage are identified as a key element of increasing digital literacy (Tamborg et al., 2018; Yang et al., 2018). Digital technologies are effective in motivating and engaging students (Chen & Macleod, 2021).

Students leverage technology for reading, writing, and communicating as they access, acquire, comprehend, analyse, evaluate, create and communicate knowledge in multiple modes and through multiple representations (Barrot, 2021; Chen & Macleod 2021; Colwell & Hutchison, 2015; Dwyer & Larson, 2014; Williams & Beam, 2019).

B1.6 Pedagogical Strategies, Approaches and Methodologies to Support Disciplinary Literacy at Primary and Post-primary Levels[34]

Disciplinary literacy is the focus of growing attention in the research literature at both primary and post-primary level (Shanahan & Shanahan, 2008). Integrated literacy and content area instruction has the potential to enhance literacy skills (e.g., vocabulary, comprehension, writing proficiency) while concurrently developing content area knowledge throughout the school system (Guthrie et al., 2004; Cervetti et al.,

[34] Dwyer, B., Burke, P., Kennedy, E. (2022). *Pedagogical strategies, approaches and methodologies to support disciplinary literacy at primary and post-primary levels*. *A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881295

2006). The findings from the literature challenge the separation of literacy from content area instruction and suggest a shift towards the full integration of both in the school curriculum (Hwang et al., 2021).

Disciplinary literacy involves “knowledge of and skill with the specialised linguistic codes, technical vocabularies, and discourse practices that draw from and reproduce the epistemic understandings and routine practices of a discipline” (Moje, 2015, p. 257). In schools, teachers can support students to gain insights into how questions are asked and answered within the discipline, how conclusions are drawn, supported, contested and defended (Goldman et al., 2016; Shanahan & Shanahan, 2017). Instruction is tailored to the specific features and demands of each discipline. Students are better able to build knowledge and form sophisticated models, ideas and discourses in text as they apprentice themselves into disciplinary expertise. This focus on disciplinary knowledge construction provides students with meaningful opportunities to apply higher-order thinking skills and critically analyse texts. These capacities are crucial for life both in- and out-of-school.

Reading informational texts in content areas like science, mathematics, geography, and history presents challenges to the reader as they grapple with different text genres, text structures, organisational features, and typographical cues (Cervetti & Pearson, 2018). Vocabulary is more demanding and linguistic and grammatical features add to the complexity. Knowledge demands are higher on the reader and such texts often require a level of background or prior knowledge. Therefore, the literature has increasingly focused on the integration of discipline-specific literacy teaching by both generalist teachers (at primary level) and specialist teachers (at post-primary level).

Research suggests that students taught using project-based methods exhibited greater gains in content knowledge, had higher levels of engagement, and had more positive perceptions of subject content than their traditionally taught peers (Holm, 2011; Balemen & Keskin, 2018; Duke et al., 2021). Teachers need supportive school structures including resources and time to plan and enact inquiry units, and a strong base for disciplinary teaching and inquiry or project-based approaches (Hasni et al., 2016; Kalinowski et al., 2019; Scott et al., 2018).

The available evidence indicates that there are substantial benefits to be gained from integrating writing with learning in different subjects at both primary and post-primary level (Graham et al., 2020). This writing can take a number of different forms and modalities, depending on subject-specific demands (Shanahan & Shanahan, 2008; Graham et al., 2020). It should be supported by the associated reading of appropriate discipline-specific texts in a critical manner, the linkage of writing with subject-based inquiry and the teaching of appropriate strategies to support the planning, drafting and revision of text (Ockenburg et al., 2019; Weiss et al., 2021; Wissinger and Ciullo; 2018). This form of writing provides opportunities for students to engage critically with sources and to craft and hone their own thinking.

B2. Pedagogical Strategies to Support Numeracy Development[35] [36] [37] [38] [39]

In Literacy and Numeracy for Learning and Life: The National Strategy to Improve Literacy and Numeracy Among Children and Young People 2011-2020 (Department of Education and Skills [DES], 2011), it is stated that:

> Numeracy is not limited to the ability to use numbers, to add, subtract, multiply and divide. Numeracy encompasses the ability to use mathematical understanding and skills to solve problems and meet the demands of day-to-day living in complex social settings. To have this ability, a young person needs to be able to think and communicate quantitatively, to make sense of data, to have a spatial awareness, to understand patterns and sequences, and to recognise situations where mathematical reasoning can be applied to solve problems (DES, 2011, p. 8).

An initial search of the literature using only the term *numeracy* yielded no articles of a systematic review nature. Therefore, *mathematics* and new search terms

---

[35] O'Neill, S., Gillic, C., & Kingston, M. (2022). *Pedagogical strategies, approaches and methodologies to support numeracy in early childhood education. A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881705

[36] Harbison, L., Farrell, T., & Ryan, M. (2022). *Pedagogical strategies, approaches and methodologies to support numeracy in early childhood education. A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881290

[37] Grimes, P., Dooley, T., & NicMhuiri, S. (2022). *Pedagogical strategies, approaches and methodologies to support numeracy in early childhood education*. *A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881285

[38] Butler, D. Giblin, F., Kingston, M. (2022). *Numeracy and digital learning: Use of digital technologies as tools for numeracy development. A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881367

[39] Dooley, T. & Ryan. M. (2022). *Numeracy: Integration across primary and post-primary curricula. A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881282

associated with an expanded understanding of numeracy including that of *mathematical literacy* were added.

> Mathematical literacy is an individual's capacity to identify and understand the role that mathematics plays in the world, to make well-founded judgments and to use and engage with mathematics in ways that meet the needs of that individual's life as a constructive, concerned and reflective citizen. (OECD, 2006, PISA, p. 72)

Thus, the five reviews synthesised in this section encompass a holistic view to the concept of developing numeracy, spanning the learner's journey from Early Childhood Education and Care (ECEC) (O'Neill et al., 2022), through primary (Harbison et al., 2022) and post-primary school (Grimes et al., 2022). They further consider leveraging the use of digital technologies (Butler et al., 2022) and embedding numeracy within the subject of mathematics and across the curriculum (Dooley & Ryan, 2022). A number of themes emerged – some of which were overlapping. These are encapsulated in this summary with regard to the four key elements for developing numeracy, namely *real-life contexts, mathematical knowledge, tools*, and *dispositions,* as identified by Goos et al. (2014, 2019).

Attention to Numeracy in Real-life Contexts

The everyday nature of mathematics should guide learning in ECEC settings. Babies and toddlers' innate mathematical abilities should be informally *developed through daily experiences, interactions, and routines*. As young children *explore and make sense of the world around them*, they discover mathematical concepts in meaningful and developmentally appropriate ways. The centrality of play in the learning process for young children needs to be recognised. Thus, it is important that early childhood educators realise the potential for *mathematical ideas to be explored in play situation*s and that they engage with and extend children's understanding and learning during play activities (Dooley et al., 2014; EEF, 2018; Vetter et al., 2019). It is also important that intentional teaching of varied early numeracy experiences is utilised to provide children with such opportunities as engaging in *real-world problem-solving based on active and hands-on experiences*. Furthermore, it has been found that the use of *children's literature* allows for integrated learning across the curriculum, connects with "children's life experiences and their interests" (National Council for Curriculum and Assessment [NCCA], 2020, p. 6) and *embeds mathematics in real-life*

problem-solving contexts, thus helping children to see the usefulness of mathematics in their own lives (Edelman et al., 2019).

Numeracy skills such as *problem solving and modelling* can be developed through engaging with computer programming (often referred to as coding) and robotics. Similarly, computational thinking supports the development of *mathematical thinking* (Shute et al., 2017). More specifically, both programming and mathematical modelling *require the abstraction of real-world problems* (Zong & Zia, 2020), the formulation as *computational models*, the *application of strategies and algorithms* to solve them, and the *interpretation of a solution*. These shared sub-skills may explain the strong and positive transfer effects on mathematical skills (Scherer et al., 2019; Popat & Starkey, 2019, Sun et al., 2021b; Fidai et al., 2020).

Application of Mathematical Knowledge

Mathematical knowledge for teaching comprises two essential elements, subject matter knowledge (the what of teaching) and pedagogical content knowledge (the how of teaching). Furthermore, emphasis needs to be placed on developing educators' beliefs about mathematics (Dunekacke et al., 2016). Beliefs mediate the relationship between subject matter and pedagogical content knowledge, thus impacting on the quality of teaching and learning experiences (Chen et al., 2014; Linder & Simpson, 2018). With regard to numeracy development, there is the further need to consider the interplay between mathematical knowledge for teaching, and technological, pedagogical, and content knowledge. Teachers' use of digital tools to support numeracy development in early childhood, primary and post-primary mathematics education is very dependent on how numeracy is understood (Noss & Hoyle,1996; Schoenfeld, 1992, 2004), how its development can be measured or accessed (Fullan & Langworthy, 2014; See et al., 2021) and if it can be considered without regard to the pedagogical orientation of the teacher.

The mathematical knowledge of the teacher is central to mathematics teaching and learning as it influences the educator's identification of a child's current level of understanding and supports them in devising an appropriate pathway for future learning (Perry & Dockett, 2013; Gillic, 2020). Early childhood educators require knowledge of children's mathematical development and an understanding of how to communicate mathematical ideas in a relevant and meaningful way to young children (Ginsburg, 2016) and to respond to or enhance children's play in a mathematical way

(Gasteiger & Benz, 2018). Mathematical knowledge further influences how a teacher elicits and responds to student thinking and provides appropriate feedback which is at the core of effective classroom discussions (Anthony & Walshaw, 2007; Apthorp et al., 2012; Dietrichson et al., 2017; Dietrichson et al., 2020; Hodgen et al., 2018). Engaging children in *mathematical talk and discussion* promotes mathematical thinking and provides children with opportunities to construct and communicate their mathematical reasoning (Merritt et al., 2017). It may also support children in developing a range of higher-order thinking skills such as justifying and analysing. Harskamp (2014) indicated an overall medium positive effect of computer technology on mathematics achievement. However, Hardman's review (2019) states the impact of digital technologies is only possible with constructivist pedagogy and Slavin (2013) indicates that technology innovations had their largest effects when combined with instructional process programmes that enabled teachers to use multiple strategies (e.g., cooperative learning and metacognitive development).

Interventions of a small-group nature, with hands-on learning, on a regular basis, have a significant positive impact on targeted mathematical concepts (Rolfhus et al., 2013; Peltier et al., 2017, Deunk et al., 2018; Stevens et al., 2018). *Early interventions* of shorter duration are more effective (Nelson & McMaster, 2018; Charitaki et al., 2021), but for those learning English as a second/additional language (EAL), longer interventions show higher effect sizes (Arizmendi et al., 2021). One-to-one instruction is beneficial for children including those with mathematical difficulty and EAL (Wang et al., 2016; Arizmendi et al., 2021). It is important that interventions to improve mathematics performance should have a broader focus than improving mathematical language (Alt et al., 2013; Stevens et al., 2018; Powell et al., 2020; Arizemendi et al., 2021). Learners with EAL and students with reading difficulties *require authentic assessment* that distinguishes between literacy competence and mathematics performance (Castro-Olivo et al., 2011; Ramirez et al., 2013; Alt, 2014; Cason et al., 2019; Powell et al., 2020) so that any deficit in language competence is not confused with conceptual understanding (De Villiers, 2015). It is worth noting that the New *Drumcondra Primary Mathematics Test* allows for any words to be read for pupils who are having a reading difficulty to reduce the effect of reading ability on mathematics performance (ERC, 2018).

Different forms of numeracy integration such as Science, Technology, Engineering, and Mathematics (STEM)/Science, Technology, Engineering, Arts, and Mathematics (STEAM) and the integration of two or more subjects ("content-and subject-based integration"), such as Content and Language Integrated Learning (CLIL), meet different learning goals. Transdisciplinary, where disciplines are merged without boundaries, and interdisciplinary approaches, which brings several disciplines together under a common theme, but with each discipline remaining discrete, are endorsed in the literature as enhancing student learning (Askew, 2015; Belbase et al., 2021; Carter et al., 2015; Geiger et al., 2015; Perignat & Katz-Buonincontro, 2019; White & Delaney, 2021). However, integration can be superficial in nature unless there is respect by teachers for all subjects concerned and *specific learning goals* are identified around all disciplines being integrated (Ahlskog-Björkman & Björklund, 2016; Belbase et al., 2021; Gao et al., 2020; White & Delaney, 2021). Challenges to effective integration of numeracy include teachers' poor understanding of and negative attitude towards the process – particularly transdisciplinary and interdisciplinary approaches – lack of interrogation of, and explication of learning outcomes across all subjects concerned, and assessments targeting monodisciplinary rather than interdisciplinary knowledge (Belbase et al., 2021; Martinnen, 2015; McGee & Hostetler, 2014; McKinney et al., 2014). Authentic assessment focused on evaluating learners' success in achieving all learning intentions is warranted (Gao et al., 2020). A supportive environment includes commitment from management to the ideas and principles of integrated learning (Belbase et al., 2021), a recognition by teachers of the academic status of different subjects and an openness among them to communicate with other disciplines.

Use of Tools

Studies indicate that tools, representational, physical, and digital, play an important role in developing students' numeracy, particularly in relation to higher order mathematical skills, such as problem-solving, mathematising and reasoning (Carbonneau et al., 2013; Cirillio et al., 2016; Ginsburg, 2016; Kul et al., 2018). Representations facilitate children to develop their own ways to model the mathematics they encounter. Making meaningful connections between different types of mathematical representations supports conceptual understanding and increases students' mathematical achievement throughout primary school (Bryun & Joung, 2018; Sokolowski, 2018). When compared with teaching using only abstract mathematics symbols, the use of physical manipulatives was found to have a positive impact on

student learning. Effects were mediated by the levels of instructional guidance provided.

The nexus between the use of digital technologies and numeracy development is a complex issue. It can be challenging to disentangle the intricacies of factors at play between the use of technology and student achievement, motivation, and attitudes in the context of mathematics (Higgins et al., 2019) from the possibility that results may vary based on the different aspects of the intervention examined (e.g., technologies used, duration, content area) or education level. Digital tools designed with a particular emphasis on mathematics were found to have a more positive impact on learning than more general tools (e.g., iPad use). Particular digital technologies (e.g., Dynamic Geometric Software; Virtual manipulatives) provide students with opportunities to gain access to mathematical representations and visualisations that would not be possible to explore on paper or using concrete manipulatives, to experiment with complex ideas that would otherwise be inaccessible (Aliyu et al., 2021; Ayub et al., 2012; Beauchamp & Kennewell, 2013; Costică, 2015; Donnelly-Hermosillo et al., 2020) which in turn positively impact student achievement (Chan & Leung, 2014; Juandi et al., 2021a; Moyer-Packenham & Westenskow, 2013) and can promote higher-order thinking skills such as critical thinking, deductive thinking, and visualisation skills (Aliyu et al., 2021; Browning et al., 2011).

Promotion of Positive Dispositions towards Numeracy

Having a positive or productive disposition towards numeracy is identified as one of the key components towards developing mathematical proficiency in the mathematics curriculum specifications at both primary and post-primary level, referred to as the "habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence, perseverance and one's own efficacy" (NCCA, n.d.). A wide range of strategies associated with *metacognition and self-regulated learning* is found to facilitate student learning of mathematics (Donker et al., 2014; Hodgen et al., 2018; Shin & Bryant, 2015). *Reflections* by students *on their thinking* through *verbalization* or *writing* emerge as particularly important (McDonald & Smith, 2020; Merritt et al., 2017). The development of metacognitive and self-regulated learning skills takes time, the role of the teacher is important, and in post-primary schools, a *focus on learner motivation* may be more effective than a focus on cognitive strategies (McDonald & Smith, 2020).

Problem/project-based learning and *problem posing* are pedagogical approaches to integration of numeracy across the curriculum that support *high-quality learning* by primary and post-primary students (Bennison, 2015; McDonald & Smith, 2020; Merritt et al., 2017). Mathematical problems vary from structured to unstructured and can stem from real-life contexts and more abstract mathematical situations (Cason et al., 2019; Hodgen et al., 2018; McDonald & Smith, 2020; Merritt et al., 2017). An emphasis on problem solving and problem posing in the teaching and learning of all strands of mathematics helps to improve students' achievement in and attitude towards mathematics as well as motivation to engage in the subject (Bicer et al., 2021; Hoth et al., 2017). *Problem-based learning* supports children's *active participation* in the process of solving mathematical problems from the outset. It fosters collaborative learning, encourages knowledge retention and conceptual development, a *positive attitude towards mathematics* and leads to higher mathematical gains (Boaler, 2015; Cason et al., 2019; Cirillio et al., 2016; ETI & DES, 2015). There is evidence that this is true for all students, regardless of their level of attainment in mathematics – however, careful consideration needs to be given to the practices that support different learners (Anthony & Walshaw, 2007; Dietrichson et al., 2017; Hodgen et al., 2018; Lein et al., 2020).

Collaboration has been found to have positive effects on both *student achievement* and *student attitudes* towards mathematics, particularly at post-primary level (Anthony & Walshaw, 2007; Baker et al., 2015; Hodgen et al., 2018). Homogeneous ability grouping in primary schools, does not appear to benefit learners at any level of achievement and in fact appears to disadvantage those who are achieving at a lower level (Merritt et al., 2017; Drunk et al., 2018). While there is some evidence of positive effects of peer-tutoring – a specific type of collaboration – as of yet there is limited evidence in the context of post-primary mathematics. Findings from the systematic reviews claim that *gender* has no significant impact on children's mathematical abilities or achievement (Ghasemi & Burley, 2019; Ghasemi et al.,2019), although performance on international assessments might advise some caution in over-emphasising this point. For example, in NAMER 2014 boys significantly outperformed girls at 2nd class although the difference was only 5 scale score points. Furthermore, in PISA 2018, boys significantly outperformed girls across OECD countries (i.e., according to the OECD average), though again this difference was relatively small (5.2 scale score points).

Conceptual understanding “comprehension of mathematical concepts, operations, and relations” (NCCA, n.d.) *and procedural fluency* “skill in carrying out procedures flexibly, accurately, efficiently, and appropriately” (NCCA, n.d.) is promoted through providing opportunities for children to engage in *making sense of the mathematics* rather than employing procedural methods by rote (ETI & DES, 2015). Number sense methodologies develop children’s *agency and ownership* of mathematics, enhance mathematical discourse, enable meaningful connections across concepts to be made, thus supporting *flexibility and fluency* (Boaler, 2015; Carson et al., 2019). The curricula at both primary and post-primary levels refer to such components of developing mathematical proficiency as that of “strategic competence—ability to formulate, represent, and solve mathematical problems in both familiar and unfamiliar contexts” and “adaptive reasoning—capacity for logical thought, reflection, explanation, justification and communication” (NCCA, n.d.).

Mathematical writing promotes engagement with mathematical processes and an opportunity for children to *creatively demonstrate their knowledge and understanding* of mathematical concepts (Trakulphadetkrai et al., 2019; NCCA, 2020). It is most effective when embedded as an integral part of teaching and learning and is of particular benefit in catering for the needs of high-achieving students (Firmender et al., 2017; Graham et al., 2020).

Integration of numeracy across the curriculum has clear potential to benefit primary and post-primary students’ learning. For example, STEM/STEAM education has *positive effects on student creativity*, and brings about improved performance in assessed learning outcomes, including “non-traditional” outcomes such as *increased student collaboration* and the provision of opportunities for *community involvement* (Belbase et al., 2021; McDonald & Smith, 2020; Merritt et al., 2017; White & Delaney, 2021). *Parental perspectives and engagement* is an important indicator of children’s attitudes towards mathematics and their achievement. Bridging the gap caused by socio-economic factors such as poverty and/or marginalisation requires specific and targeted interventions. A focus on number sense approaches and conceptual understanding starting in the early years must underpin initiatives in this area (Ramirez et al., 2013; Fan et al., 2017; Choi & Han, 2020). With regard to *subject- and content-based integration*, improved learning outcomes have been noted with integrating

mathematics in a wide number of areas. CLIL has been found to *enhance learning* in a content area and in the language of instruction (Harris & Ó Duibhir, 2011).

Concluding Remarks

How *numeracy is conceptualised* influences the *perception* of how it can be *taught* and *assessed*. Of note, only one systematic review (Aziz & Rosli, 2021), focused on statistical literacy skills (i.e., critically understand, interpret, evaluate, and communicate statistical data through various forms of media) which is crucial in a society that is continuously bombarded with a myriad of information that involves statistical data-based arguments (Weiland, 2017). Educators in ECEC require access to professional development in mathematics teaching and learning to enhance their mathematical knowledge for teaching. In particular, training in the use of learning trajectories in mathematics may support educators in noticing, interpreting and enhancing young children's mathematical ideas (Perry & Dockett, 2013; Gillic, 2020). Professional learning opportunities for teachers to leverage the use of digital technologies has been highlighted as a key factor in their effective use (Wong et. al., 2020) and in raising teachers' awareness of the linkage possibilities (Bray & Tagney, 2029; Talib et al, 2019; Ugolini, 2019; Sun et al., 2021b). Thus, in order to achieve the maximum numeracy developmental potential, opportunities for coherent *professional learning opportunities* for all educators that address content and pedagogical approaches as well as beliefs are warranted.

B3. Assessment to Support the Development of Literacy, Numeracy and Digital Literacy

Introduction

This section addresses assessment to support literacy, numeracy and digital literacy. The first section reviews recent developments in assessment in these areas in early childhood education. The second is a systematic review of studies on the implementation of formative assessment. The third section looks at recent international developments as they relate to summative assessment.

B3.1 Assessment of Literacy and Numeracy in Early Childhood[40]

Assessment in early childhood is concerned with the processes of collecting information about children from various forms of evidence and then organising and interpreting that information to make judgements about children's development and learning (Alaçam & Olgan, 2021). It may be focused on individual children (Hussain et al., 2019; Visser et al., 2012) but may also examine group work or pedagogical practice (Alasuutari et al., 2012). Assessment can be linked to two paradigms, which are referred to in various forms: positivist, developmental, standardised or prescribed, and sociocultural, learning-based or open. More contemporary approaches position assessment as democratic (Moss, 2011), participatory (Formoshino & Pascal, 2016) and moral practices (Buzzelli 2018).

Standardised assessment provides information on how a child is developing in relation to others of the same age or grade level (Hussain 2019; Conti-Ramsden & Durkin, 2012). Standardised assessments are deemed essential in the area of special needs (Visser et al., 2012) as early detection of developmental problems enables the timely provision of supports for children and parents. However, where standardised assessment are used for other purposes (e.g., comparing average performance across groups), they have been strongly criticised (Auld, 2019; Basford 2014; Brunsek 2017; Fundus 2015; Hussain, 2019; Perlman, 2016; Robert-Holmes, 2017, 2019; Yoon, 2015) as failing to engage with the wider social context in which children operate (Hussain, 2019), and drawing on the discourse of readiness and achievement gaps, mask issues of social and economic exclusion (Robert-Holmes, 2017; Yoon 2015). Standardised instruments have also been criticised as not being sensitive enough (Conti-Ramsden & Durkin, 2012) to assess language in early childhood, particularly in relation to young children or children from different cultural and linguistic backgrounds (Verdon, et al., 2018).

Established, informal assessments (Alaçam & Olgan, 2021; Alasuutarai et al., 2014; Carr & Lee, 2012) are integral and dynamic components of teaching and learning, and are characterised by collaboration between parents, early childhood professionals' and children (Ntuli 2014; Scull, 2021; Formosinho 2014). Literature cautions against the narrowing of assessment to specific skills (Pyle & DeLuca, 2017)

[40] McCormack, M., & Guevara, J. (2022). *Assessment of literacy and numeracy in early childhood education. A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881275

and observation-based approaches that draw on multiple tools or formats offer opportunities for continual assessment (Gullo & Hughes, 2011; Wolfendale, 2000; Losardo & Notari Syverson, 2011; Picchio, 2014). These forms of assessment allow children themselves to make meaning of their learning experiences (Oliveira-Formosinho & Formosinho, 2012; Paananen & Lipponen, 2016). They provide educators with insights to their curriculum (De Luca et al., 2020; Picchio, 2014) and are used as a catalyst for reflection, and a means to review their own pedagogical practice (Lee-Hammond & Bjervås, 2020; Alasuutari, Markström & Vallberg-Roth, 2014). There is limited empirical research on the use of Learning Stories (Blaiklock, 2008 and pedagogical documentation (Alaçam & Olgan, 2021; Cooper, et al., 2014). While these approaches reveal children's learning, they do not assess that learning directly (Emilson & Samuelsson, 2014). Critiques of pedagogical documentation suggest that as a method of assessment it is demanding, time consuming (Alaçam & Olgan, 2021) and frequently lacking technical equipment and training for educators (Rintakorpi, 2016).

Consistent arguments are made through the literature for holistic assessment (developmental and academic) (DeLuca et al., 2020; Cloney et al., 2019; Alasuutari et al., 2014), which examines both breadth and depth of children's learning and development (Hoffman et al., 2014) and which includes collaboration and participation of children and families in the assessment process (Scull, 2021). Consequently, a multi-method, multi-informant approach to language assessment in early childhood is the gold standard (Conti-Ramsden & Durkin, 2012). This could include learning trajectories, which have a strong influence on the current draft Primary Mathematics Curriculum in terms of the Progression Continua that are outlined therein (NCCA, 2022b).

The literature questions what is assessed and cautions against an overemphasis on the assessment of constrained or discrete skills (Paris, 2005), which can lead to a narrowing of the curriculum, an approach that compounds existing inequalities (Casbergue, 2011). Johnson et al. (2019) suggest that it is not sufficient to assess skills and knowledge that are already known but it is important to understand children's mathematical thinking and approaches to mathematical problem solving. Equally in relation to literacy, there is a need for well-informed assessment tools and analysis

frames (Clay, 2019), as the sensitivity of some instruments relating to language and vocabulary is lower in relation to younger children (Veldhuizen et al., 2015).

Seeking to contribute to a 'civic spirit of accountability' (Formosinho, 2014, p.111), assessment needs to provide useful and usable information not only for educators and policy-makers, but also for children and families.

The development of the OECD's International Early Learning Study (IELS) has raised concerns in relation to standardised assessment of preschool children for the purpose of international comparison (Moss & Urban, 2019). The IELS adopts a positivist approach to the exclusion of other theoretical positions in the assessment process (Moss et al., 2016) and fails to recognise or account for the diversity of existing, local educational systems, culture and pedagogical practices. Given the findings from this review, which identify the need for flexible and holistic assessment in early childhood (DeLuca et al., 2020; Cloney, et al., 2019; Marbina et al., 2015; Alasuutari et al., 2014), the IELS continues to draw criticism for its narrow and de-contextualised approach.

B3.2 Formative Assessment to Support Literacy, Numeracy and Digital Literacy at Primary and Post-primary Levels [41]

Despite over two decades of intensive research on the implementation of formative assessment practices in classrooms, and on the effects of such assessment on students' learning and motivation, there is, as yet, no universally accepted definition, with different researchers defining formative assessment as it relates to their studies. A common understanding is that, when goals are clear and measurable for teachers and students, assessment data can provide feedback on progress with regard to those goals. It is also generally recognised that data can be based on instruments (for example, tests or performances), or on the skilled observations of teachers (sometimes referred to as "process"), or on some combination of the two.

Results of studies that have sought to quantify the effects of formative assessment on student achievement are mixed. While earlier studies (those published before 2000) reported large effect sizes for formative assessment, more recent reviews, which have implemented stronger quality criteria for the selection of studies,

[41] Shiel, G. & Dooley, T. (2022). *Formative assessment to support literacy, numeracy and digital literacy at primary and post-primary levels. A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881266

have reported more modest effects. Across students, effect sizes are generally larger for literacy and mathematics compared with other subjects (e.g., Klute et al., 2017; Lee et al., 2020). The outcomes for studies providing feedback in electronic format have also been mixed. Although one comprehensive meta-analysis identified “promising evidence” that digitally delivered formative assessment could facilitate learning of aspects of literacy (basic reading skills, aspects of spelling and grammar) and mathematics, the authors (See et al., 2021) conclude that formative assessment with technology was no more effective than formative assessment without technology. Such findings reflect a shortage of well-designed studies that can identify the effects of formative digital assessment.

A key finding across many studies on digital and non-digital formative assessment is that it is most effective when conceptualised as an integrated element of instruction in environments where teachers and students are jointly responsible for learning (e.g., Heitink et al., 2016; Schildkamp et al., 2020).

The research on the effects of formative assessment has also identified factors associated with the successful implementation of such assessment. These include the source of feedback (including peer- and self-assessment), quality of feedback, the use of learning trajectories or learning pathways as a basis for assessing students, the impact of tasks that reveal students’ thinking, and the pedagogical content knowledge of teachers and their professional development.

In general, all forms of feedback are effective but self-assessment and, to a slightly lesser extent, peer-assessment have a significant impact on learning (e.g., Andrade, 2019; Double et al., 2019). In general, the assignment of a grade by a peer is not recommended for primary or post-primary students. On the other hand, self-grading is found to be effective, probably because it promotes metacognition and self-regulation on the part of students (Sanchez et al., 2017). Feedback appears to be most effective when it is clear, task-related and encouraging of student effort (Hodgen et al., 2018). It can focus on achievement, effort or process. There is evidence that process feedback with a focus on strategies to bridge the gap between where students are and where they need to be is particularly valuable (Schildkamp et al., 2020). According to Van der Kleij et al. (2015), elaborated feedback, described as feedback that provides an explanation, is more effective than providing the correct answer and considerably more effective than indicating whether an answer is correct or not. Furthermore, they

found that the immediacy of feedback, especially on digital devices, was beneficial to student learning, though delayed feedback was identified as useful for more challenging or higher-order tasks.

There is some evidence that learning trajectories/pathways can provide a good basis for formative assessment, with significant development work done in mathematics, and, to a lesser extent, in literacy (Calkins et al., 2019; Hodgen et al., 2020). In the case of writing, it has been suggested that student-facing checklists based on trajectories can support students to self-assess and set goals. The use of learning trajectories as part of the design of technological assessment holds some promise as this allows for adaptive feedback. Revelatory tasks – tasks which reveal student thinking – have potential in this regard as they allow teachers to garner insight into students' knowledge and misconceptions and also their disposition toward the subject(s) involved and their motivation to engage (e.g., Burkhardt & Schoenfeld, 2019; Dooley et al., 2014; Kennedy et al., 2012). Teachers can gather data as appropriate from students' engagement in these tasks as evidentiary warrants, for example, portfolios, work samples, audio recordings and photographs. Such data can also emanate from other curricular subjects, such as an integrated project that might make demands of a student's literacy and/or numeracy skills.

In providing feedback to students, teachers need to decide whether immediate feedback is required, and, if so, the nature of that feedback. They also need a knowledge of students' misconceptions in literacy and numeracy and the pedagogical strategies that might help to address these misconceptions (Burkhardt and Schoenfeld, 2019; Van der Kleij et al., 2015). An understanding of learning trajectories/pathways in order to design appropriate learning tasks and extend students' thinking is also required. This entails the development of teachers' pedagogical content knowledge (PCK) relevant to literacy and numeracy as well as an understanding and knowledge of formal and informal assessment processes (Schildkamp et al., 2020). A key finding is that the relevant professional development should extend over a considerable period of time and involve expert support in order to benefit teachers' practices in formative assessment (Lane et al., 2019; Lysaght & O'Leary, 2013, 2017).

Finally, school leaders can play an important role in supporting teachers' use of formative assessment, and the strategies they use to provide effective feedback to students (Lane et al., 2019; Newman et al., 2021). The research indicates, not

surprisingly, that school leaders with responsibility for formative assessment should be knowledgeable about its purposes, and be able to provide a rationale for its use, as well as a non-threatening environment where effective use of assessment data, in all its forms, is modelled for teachers. It is also clear that decentralised organisational structures at school level, and distributed leadership are conducive to implementation of formative assessment, and to ensuring accountability pressures on teachers do not lead to unintended impacts on instructional and assessment processes. The research also indicates that the development of feedback policy at school level should offer suggestions and exemplars for making feedback more manageable, but that specific methods and features of feedback should be decided by teachers, based on their professional judgements about students' learning (Education Endowment Foundation, 2021).

B3.3 Summative Assessment [42]

Because of a dearth of systematic reviews based in the international literature on summative assessment (i.e., outcomes of experimental studies on the effects of different approaches to summative assessment), this review primarily focuses on current international trends with regard to large-scale assessments implemented at national and state levels. It does not include a detailed consideration of state examinations or international assessments, though such assessments are referred to.

Summative assessment can be defined as 'the assessment of students that occurs at the end of a period of instruction. [It] provides a holistic measurement of an individual's knowledge, skills and dispositions. . .' (Nicholas, 2018, p. 1634). In the context of the current L&N strategy, it relates to assessments such as the National Assessments of English Reading and Mathematics (NAMER) and the Programme for International Student Assessment (PISA), both of which are used to set national targets for student performance in literacy and number and are essentially low-stakes assessments for most stakeholders. It also encompasses the standardised tests that are currently administered to pupils in the Second, Fourth and Sixth classes in primary schools, and can be viewed as having high stakes at pupil, class and school levels. The recent use of test scores at the school level to allocate special education resources (e.g., O'Leary et al., 2019) will have raised the stakes, though certainly not

[42] Shiel, G. (2022). *Summative assessment of literacy, numeracy and digital literacy*. *A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7882174

to the same extent as census-based national or state-level assessments in Australia, England and the US, where summative assessment data may also be used for such purposes as evaluating the effectiveness of schools and teachers in promoting student achievement.

A tension can arise between the purposes of formative or classroom-based assessment, on the one hand, and summative assessment on the other, with trade-offs in design needed between the fine-grained information required by teachers during a particular lesson or unit of study (formative) and the broad and more comprehensive summary information needed by policy-makers (see Shepherd et al., 2018). Summative assessment often enjoys a higher status than formative assessment, and this gives rise to the possibility that teaching and learning will focus more on preparing students for summative assessment, with less attention or recognition given to formative assessment. O'Leary et al. (2019) have argued that summative assessments should provide more formative information, especially for at-risk groups such as disadvantaged students, students for whom English is an additional language, and students with special educational needs. In the future, it is likely that formative and summative assessment will merge to a greater extent, particularly as technology facilitates the scoring of more complex assessment tasks (Klenkowski & Wyatt-Smith, 2012). Looney (2019) has noted that electronic scoring systems can now score complex cognitive tasks such as problem solving, open-ended performances such as written essays, and student collaboration on constructed response formats, enabling the use of more complex tasks in summative assessment.

Recent developments in technology have facilitated the use of interim summative assessments to generate formative assessment information. For example, interim assessment blocks (IABs) can be used throughout the school year to assess smaller bundles of content, with focused IABs assessing a limited number of learning outcomes (e.g., multiplication and division within 100, numbers and operations in base 10). In some cases, performance may be reported on the same scales as full standardised tests. In New Zealand's e-asTTle programme, teachers can play a role in the selection of items for interim tests that are either 12 or 60 minutes in length. Schildkamp and Kuiper (2010) and Poortman and Schildkamp (2016) have provided evidence that Data-based Decision Making (DBDM), which involves the systematic analysis of existing data sources (such as interim assessments) within the school by

teachers, can promote learning, whether at the level of the school, the class or the individual student.

Recent developments in technology have also facilitated new developments in summative assessment. Bennett (2015) noted a range of possibilities including adaptive testing (allowing greater precision in identifying where the performance of high- and low-achieving students lies), the assessment of new constructs, the development of new item-types, automated scoring, and the administration of tests at different times during the school year with performance aggregated to determine proficiency (that is, greater integration of instruction and assessment). Some of these developments are already evident in international assessments such as PISA and may soon be reflected in nationally developed tests.

Technology may also help to make current summative assessments more inclusive of all students in the education system including those with special education needs by providing a range of accommodations such as large print and assistive technology. National Curriculum Assessment in England (which is still paper-based) includes alternative teacher-based assessments for students who are studying well below the curriculum for their class level, and an Engagement Model for the most-challenged students, where teachers rate them on constructs such as persistence and initiation (see Standards and Testing Agency, 2020).

In recent years, national and state-level assessment programmes in other countries have begun to report measures of student progress, alongside scores that reflect performance at a particular point in time. The Massachusetts Comprehensive Assessment System (MCAS) reports on performance with reference to student growth percentiles (e.g., Lockwood & Cestellano, 2015). These enable stakeholders to evaluate growth in performance relative to some intake measure such as performance on an earlier assessment. National Curriculum Assessment in England at Key Stage 2 uses a similar approach, allowing for a comparison between a student's expected score (based on how students with similar scores at Key Stage 1 perform at Key Stage 2) and their achieved score. Although student scores derived from these and other valued added models are often used to evaluate teacher and school effectiveness (a practice not without problems – see Marks, 2021; Guarino, 2018), they may be of value in monitoring the progress of individual students and groups.

A number of national assessment programmes also support the interpretation of test scores by taking socio-economic context into account. The Australian National Assessment Programme – Literacy and Numeracy (NAPLAN), which is administered on an annual basis in Years 3, 5, 7 and 9, reports average performance at school level with reference to the performance of other students with similar socioeconomic backgrounds. The focus on students (rather than schools) is intended to reduce competition between schools. In Scotland, schools can compare the performance of their school leavers on literacy and numeracy (based on national exams) against virtual comparators (groups of students of similar socioeconomic background). Although not without criticism, these approaches allow for an additional layer of interpretation in interpreting performance.

The reporting of test scores (for example, STen scores) to parents and other stakeholders is not uncommon in assessment programmes in other countries. However, these are often accompanied by descriptors of performance. In England, parents and other stakeholders are informed if students have reached the expected performance level for their age group, essentially based on a single cut-off score. In Massachusetts, performance is also reported on with respect to level such as ‘partially meeting expectations’, ‘meeting expectations’ and ‘exceeding expectations’. These descriptors can provide stakeholders with more specific, standards- or curriculum-based feedback on performance.

In assessing literacy and numeracy, a number of assessment programmes (most noticeably PISA) seek to include authentic, real-life assessment tasks. Such tasks seek to capture the essence of literacy and numeracy (as opposed to English reading and mathematics), as they seek to measure performance on the types of tasks that students would be expected to encounter outside of school, as well as in school contexts. The transition of PISA to computer has also seen a shift from more basic reading literacy to digital literacy, where a broader range of assessment tasks based on multiple texts and a greater emphasis on evaluating information, are presented. Countries such as Australia, England and the United States all include the assessment of writing – a key component of literacy – in their assessment programmes, while it is noticeably absent from NAMER. Assessment programmes such as NAPLAN in Australia and PISA have begun to implement online measures of interactive or collaborative problem solving on a trial basis. This reflects an interest in capturing

another real-life skill – the ability of students to interact with others in solving real-life problems.

It is noteworthy that a key recommendation relating to assessment in the initial NLNS report has not been implemented. This relates to the administration of standardised measures of literacy and numeracy to post-primary students at the end of Second year. The intention was that these tests would provide useful information to schools about students' progress and their learning needs. They would also contribute information on standards at national level and would provide a useful reference point if PISA scores changed as they did in 2009. Although the implementation of standardised testing at the end of Second year was postponed to enable schools to implement new specifications and assessment approaches at Junior Cycle level, the case for implementing them has not changed. Also, as envisaged in the interim review of the NLNS, there would be value in assessing pupils' digital literacy skills in schools selected to take part in NAMER to heighten teachers' awareness of the importance of promoting such skills.

B4. Supporting Literacy, Numeracy and Digital Literacy Development of Diverse Learners

Introduction

In order to address the particular issues pertaining to literacy and numeracy support for children and young people with additional needs, we did separate reviews in relation to the following groups of learners: children and young people with special educational needs from early childhood settings to those in Youthreach (six separate reviews depending on sector and area of disability where applicable, including learners using Irish sign language and braille); children and young people experiencing educational disadvantage; Travellers and Roma; Youthreach provision and higher achievers. In terms of organisation the findings will be presented by sector (early childhood, primary/post primary and Youthreach). Issues pertaining to learners with EAL are covered in Section B1.

While the reviews were conducted according to the above groups and the research literature highlights some common themes in relation to each, it is important to stress the unique learning profile of each learner. The key implication of this is that while recommendations may offer insight into possible lines of support based on group

characteristics, it is essential that a holistic profile of the learner based on strengths, interests, concerns and areas for development informs class and small group/individual interventions.

Students will mostly experience literacy and numeracy in their mainstream or special classes. Therefore, the first level of support occurs in this context. There is a challenge in addressing student variability and identifying student strengths to build on. The framework provided by *Universal Design for Learning* offers one route with rich possibilities for creative teacher planning, assessment and inclusive pedagogy in addressing the strengths and needs of all learners. This can potentially be greatly enhanced by collaborative problem solving in planning and teaching in co-teaching situations. Building in time for such collaborative planning and providing increased opportunities for co-teaching has the potential to be transformative in increasing the capacity of teachers in meeting a greater diversity of needs in mainstream classes. If this were successful it could reduce reliance on small group withdrawal which, however, will have a continued need to be provided and has a strong evidence base (Monei & Pedro, 2017).

B4.1 Early Childhood Education and Care for Learners at Risk of Educational Inequality (Disadvantage) [43]

French (2022) synthesised the literature on supporting children at risk of educational inequality in developing literacy (digital literacy) and numeracy in early childhood education and care (ECEC). She found a dearth of reviews which focus on children from birth to four years despite compelling evidence that young children engage in such activities from birth (MacDonald & Murphy, 2021). However, studies demonstrate that for young children, particularly those who face adversity, poverty and educational inequality, high quality Early Childhood Education and Care (ECEC) can lead to better school achievement, higher cognitive test scores, fewer special education placements and higher school retention rates (OECD, 2018; Taggart et al., 2015).

French (2022) highlights a number of key findings around vocabulary learning, shared-book and dialogic reading, emergent writing, adding parent and skill-based

[43] French, G. (2022). *Supporting literacy and numeracy in early childhood for those at risk of educational inequality. A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881255

programmes to ECEC, using culturally informed approaches, use of multi-tiered systems, targeted interventions, successful transition to school, and the importance of play. Findings in relation to each of these will be briefly outlined.

In the context of vocabulary learning and shared book reading, knowing the meaning of words (vocabulary knowledge) is predictive of future reading comprehension (Christ & Wang, 2011). Providing explicit information about words being taught *and* giving children opportunities to engage in word learning in the context of storybook reading or other meaningful activities may be the most effective approach for enhancing word knowledge and word meanings for at-risk young children (Marulis & Neumann, 2013). Reading development starts before children are formally taught to read (Mol & Bus, 2011). The main approaches to enhance vocabulary learning include: purposively exposing children to print (Mol & Bus, 2011) and advanced words; directly teaching children the meanings of words through labelling, recasting, questioning and employing multiple methods (Christ & Wang, 2011) or comprehensive approaches, which include phonemic awareness and other skills along with child-initiated activities (Chambers, 2016). Book-sharing and dialogic reading are essential (Dowdall et al., 2020). Research emphasises the critical role of adult-child interaction during book reading for vocabulary learning (Wasik et al., 2016).

Six-month-old babies are capable of making marks in their yoghurt on their highchair trays. From two years of age children create, express, imagine, and test hypotheses and understanding about their world through making marks on a page or a digital tablet (Neuman, 2022). Enhancing the quality of the environments and adult engagement within the context of authentic early writing experiences (Hall et al., 2015) and invented spelling facilitates young children's early literacy development (Ouellette & Sénéchal, 2017; Albuquerque & Alves Martins, 2019).

Joo et al. (2020) examined the impact of adding ECEC enhancement programmes to existing programmes. The addition of fully developed parent programmes and skill-based curricula to ECEC programmes can result in improvements to a range of children's outcomes. Parents who talk more with their children also tend to use more of the rich vocabulary, complex ideas, and back-and-forth conversation known to promote language growth. Furthermore, adding skill-based curricula to ECEC programmes, especially literacy/language-specific curricula, results in improvements to children's cognitive abilities, pre-academic skills, and overall

outcomes (Ciesielski & Creaghead, 2020; Joo et al., 2020; Markussen-Brown et al., 2017).

Culturally informed approaches include: culturally relevant teaching, culturally responsive teaching, culturally sustaining pedagogies. Such approaches are rooted in multicultural education, where the focus on equity marks a departure from the classification of culturally diverse students as having a cultural deficit (Kelly et al., 2021). Larson et al. (2020) found positive effects for all language-promoting interventions that were both linguistically and culturally responsive. Interventions deemed linguistically responsive intentionally support use of children's home language. Culturally informed literacy instruction is an orientation and not a set of activities. However, a repertoire of approaches can be developed (e.g., Cartledge et al., 2015 suggest developing reading passages by listening to children describe their daily experiences).

A meta-analysis on multi-tiered systems of support (MTSS) for language, literacy and numeracy in early childhood was conducted (Shepley & Grisham-Brown, 2019). Tier 1 involves general education; 2 targeted interventions usually in small groups and 3 individualised supports. Compared to interventions with younger children, there are particular challenges in implementing approaches targeted at older school-going children (e.g., diversity of: settings, funding streams, curricula and interventions) leading to a lack of implementation fidelity; ECEC favours child-initiated, play-based approaches, which are at variance with teacher–led approaches. Statistically significant findings are evident for literacy and social-emotional outcomes. However, due to the heterogeneity of research findings, caution was expressed in providing guidance on system-wide MTSS models in ECEC.

A systematic review focussed on interventions targeting students with or at risk of academic difficulties in literacy and mathematics and gave unambiguous positive results, from the perspective of publicly funded scaled up interventions (DeAngelis et al., 2018). Some of the similarities in the projects include qualifications in ECE, maximum class size of 20 children with a minimum of two adults, and a preference for children at risk while including all children.

Despite compelling evidence that children "do engage in mathematics education prior to four years of age, and that they possess many mathematical competencies",

there is a dearth of reviews which focus on children from birth to four years (MacDonald & Murphy, 2021, p.522). Nonetheless some key findings are worthy of consideration. In terms of selecting early numeracy interventions, children “who do not develop early numeracy skills are likely to have difficulty with achievement in math in later” years (Nelson & McMaster 2019, p. 194). Early numeracy, which features a set of foundational skills in understanding whole numbers (such as quantity, counting, comparison) contains the building blocks to learning more complex skills such as addition and subtraction. The research emerging from the USA is comprehensive and robust but not necessarily directly relevant to Ireland. Given our different cultural context and policy development, it is therefore very important that we develop more research-based evidence here.

Predictors of successful transition to school include: exposure to high quality ECEC, experience of mathematical and literacy-based tasks, warm parenting style, supportive home environment, learning related to personal child characteristics, social behaviour, and health and socio-economic status (Linder et al., 2013). Some studies are rooted in the concept of ‘school readiness’ (DeAngelis et al., 2018, Joo et al., 2020; Linder et al., 2013). Bingham and Whitbread (2018, p. 364) argue that the ‘schoolifying’ of the ECEC years – i.e., before compulsory school age – “is not supported by the research evidence and that it is very likely to be damaging, particularly for the most deprived and youngest children”. The real issue is determining how to meet the children’s socio-emotional needs in a smooth transition to school and consistency in teaching methodologies that include a play-based curriculum (physical, construction and social play), child-initiated experiences and responsive interactions in ECEC settings and primary school.

Play can promote learning in a range of academic domains and can close achievement gaps for children ages 3 to 6 years. However, play “is not taken seriously as an inclusive solution to the development of children’s knowledge and holistic skills…More often, play is seen as something separate from the seriousness of school and work” (Dowd & Thomsen. 2021, p.8). As the natural mode of learning for children, play is *imperative* as a strategy for enhancing young children’s learning.

B4.2 Supporting the Literacy and Numeracy Development of Children with Additional Needs in Early Childhood Education in Ireland (from Birth to 7 years) [44, 45]

The McNally and O'Keeffe (2022) review on early numeracy for children with additional needs review found little research in numeracy for young children with additional needs and recommendations are made in the light of a low evidence base. This lack of research is surprising given the importance of early numeracy development for later academic success (Claessens, Duncan, & Engel, 2009). However, a number of studies have demonstrated the effectiveness of three activities. Firstly, shared reading with a focus on teaching key numeracy skills shows promise for supporting numeracy for children with additional needs. This is a well-established activity in early childhood settings; however, little is known in the Irish context of the extent to which texts focusing on numeracy are used. Secondly, e-books similarly may be an engaging format for children with developmental delays who are at-risk of Learning Disability in which to support numeracy development and this also fits with emerging literature around the effectiveness of digital formats for shared reading. Thirdly, explicit approaches and direct instruction to teach discrete skills are likely to be effective in the context of a behavioural or applied behaviour analysis approach to instruction. Research often includes the researcher as the interventionist given the specific training required for these approaches, and more research is needed where educators are the interventionist to allow for greater understanding as to what may be the most effective and practical strategies for supporting all children in inclusive settings.

The McNally and O'Keeffe (2022) review also found few systematic reviews on literacy support in the early years for children with additional needs. This was surprising given the importance of early childhood for literacy development. From the reviews conducted which focused on children on the autism spectrum, those with learning disabilities and at risk of reading difficulties, a number of pedagogical practices were found to be effective. These included adapting shared reading to potentially support listening comprehension, expressive communication and a range of

---

[44] McNally, S., & O'Keeffe, C. (2022a). *Supporting the literacy development of children with additional needs in early childhood education in Ireland (from birth to 7 years). A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881253

[45] McNally, S., & O'Keeffe, C. (2022b*). Supporting the numeracy development of children with additional needs in early childhood education in Ireland (from birth to 7 years). A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881248

communicative and non-communicative acts, including participation and engagement for children with additional needs.

For those children with learning disabilities and at risk of reading difficulties who are a less defined group, Wanzek et al. (2018) emphasise the importance of intensive early intervention that targets phonological awareness, phonics, word recognition and fluency.

B4.3 Addressing Achievement Gaps between Disadvantaged and non-Disadvantaged Students at Primary and Post-Primary Levels [46]

Kennedy and Shiel (2022) reviewed research addressing the achievement gaps between disadvantaged and non-disadvantaged students in primary and post-primary schools. While the performance students of low socio-economic status (SES) has improved over time internationally and in Ireland (e.g., OECD, 2020; Hanushek et al., 2020; Kavanagh et al., 2017), these and other studies (e.g., Bai et al., 2001; Cheung et al., 2021) show that gaps in performance between high- and low-SES students persist at primary and post-primary levels and are difficult to bridge. Hence, interventions or strategies that improve overall performance at system level, including the performance of both high- and low-achievers, may not succeed in bridging achievement gaps.

Nevertheless, there is evidence that individual school-based and out-of-school interventions can accelerate the performance of low-SES students. Programmes in language, literacy and mathematics have all had some effects on student performance (e.g., Marulis & Newman, 2013; Dietrichson et al.,, 2017, 2020, 2021; Silverman et al., 2020), though outcome measures sometimes focus on short-term gains rather than long-term transfer. Features of school-based programmes that are moderately effective in improving the performance of low-SES students at primary and post-primary levels include peer-assisted learning, small-group instruction (up to 5 children) and progress monitoring (Dietrichson et al., 2017, 2020, 2021). Other features, with smaller, but still significant effect sizes, include computer-assisted instruction, coaching of teachers and medium group size (more than 5 children, but fewer than a whole class).

[46] Kennedy, E., & Shiel, G. (2022). *Addressing achievement gaps between disadvantaged and non-disadvantaged students in primary and post-primary schools: A review of recent international research*. Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881164

In considering the effectiveness of programmes for low-SES/disadvantaged students, it is useful to make a distinction between those that are school-based (in that they are implemented in a school in particular classes or grade levels), and those that are school-wide or whole-school. The research evidence shows that school-wide programs such as Success for All (Slavin et al., 1993, cited in Cheung et al., 2021) also produce small to moderate effect sizes. Such programmes are typically intensive (two to three years in length) and may involve re-grouping children by ability across class levels. They may also include one-to-one or paired tutoring in the early grades if progress within a group is not adequate (Cheung et al., 2021). In order to reduce variation in implementation, they may include scripted lessons. A limitation of school-wide programmes is that they often focus on children in kindergarten to second grade, and place less emphasis on unconstrained skills such as vocabulary and comprehension, and more on constrained skills such as phonological skills and word reading. Furthermore, the impact of cross-age and grade level regrouping on children's reading motivation, engagement and sense of self-efficacy were not measured or reported as an outcome in studies included in the meta-analysis (Cheung et al., 2021).

While early intervention programmes can be effective (Fantuzzo, 2011; Cheung et al., 2021; Dockrell et al., 2021), they need to be followed up with appropriate longer-term supports, extending into the senior primary classes and post-primary level as the demands and complexities of texts, including their structure and vocabulary, continue to rise (Swanson et al., 2017; Dietrichson et al., 2017, 2020; Cheung et al., 2021). There is evidence to suggest that multi-tiered systems are effective in addressing literacy underachievement (Swanson et al., 2017). In such systems, a high-priority is put on optimising the quality of classroom instruction to benefit all children and to minimise the numbers of children requiring tier 2 (small group tutoring) or tier 3 (one-to-one tutoring). Multi-tiered systems are similar to the Continuum of Support Model (DE, 2007) adopted in Ireland. Puzio et al. (2020) make the point that, while differentiated instruction using small groups is an evidence-based practice, it does not represent a 'silver bullet', as there can be considerable variation in how teachers differentiate instruction within groups. This has implications for the type of support provided to teachers to operate effectively within groups and make appropriate decisions in differentiating instruction and grouping children. A useful resource for teachers in Ireland is the NEPS publication (2019) which highlights features of effective interventions for struggling readers.

Although executive functioning (defined as working memory, attention shifting and inhibition) has been shown to correlate only modestly with socioeconomic status after controlling for intelligence, Lawson et al. (2018) note that it is a risk factor for low-SES students, and that small differences in early childhood may have cumulative consequences across domains of development, including later academic performance (a phenomenon termed ‘developmental cascades’). Spatial knowledge or spatial reasoning has been identified as a skill that can be leveraged against the weak foundations in mathematics of some low-SES students (Singh, 2015).

Research has established links between literacy performance and summer vacation reading loss (Davies & Aurini, 2013; Allington & McGill Franzen, 2021), reading volume (Lindsay, 2018; Torppa et al. 2020; Van Bergen et al., 2020, cited in Allington & McGill Franzen, 2021), print exposure and leisure reading (Mol & Bus, 2011) and access to books and libraries (Neuman & Celano, 2001; Neuman & Moland, 2019, cited in Allington & McGill Franzen, 2021); all of these are most problematic and challenging for children in low-SES communities who do not have the same access to such resources as their more affluent peers.

Several studies (Cooper, 1996, cited in Weir et al., 2017; Davies & Aurini, 2013) have found that the summer loss for children from low-SES communities is roughly equivalent to the loss of a month of instruction while children from high-SES communities gain a month. Additionally, Davies and Aurini (2013), in a well-designed study, reported that in June children in the lowest-SES quartile in the study were already 5.28 months behind those in the highest SES-quartile and with summer loss they began the next school year over 7 months behind. Weir et al., (2017) citing Alexander et al. (2007) found disadvantaged children to be the equivalent of nearly three grade levels behind their more advantaged peers by 5th grade. Summer reading loss appears to be significant and cumulative over schooling.

There are some differences in the literature on the intensity that is required in summer reading programmes to effect significant change in performance, with some evidence showing that programmes involving choice of materials by students (i.e., six books), but with minimal adult intervention (Allington & McGill-Franzen, 2021), can be effective. Kim & Quinn (2013, cited in Weir et al., 2017) found the largest effect sizes were associated with the most resource-intensive classroom-based interventions (i.e., those with 13 children or fewer, those with 4 to 8 hours daily instructional time, and

those with 70 to 175 hours total programme time). Dietrichson et al. (2017) reported very small effect sizes. Interventions reviewed involved supplying books to students to read and work with during the summer, with librarians or reading coaches playing a role in book selection and required activities.

Age 8-9 (grade 2-3) is a critical time in literacy and mathematics development, as achievement at this juncture predicts later achievement (Torppa et al., 2021 cited in Allington & McGill-Franzen, 2021; Singh et al., 2015). The language and reading abilities of frequent readers differ from those who read less often (Mol & Bus, 2011), contributing to 'Matthew Effects' in reading (Stanovich, 1986). Children who read less (including many low-SES children) also tend to have reduced vocabulary size, weaker comprehension and less conceptual knowledge, all of which are related to achievement. Mol and Bus found moderate to strong correlations between print exposure and oral language and reading outcomes regardless of age, leading them to conclude that *'the outcomes support an upward spiral of causality'* (p.267) as the impact of print exposure increased with each year of education. Studies demonstrate that for lower-achievers, correlations between print exposure and reading skills are even stronger than for high-ability readers and that they out-perform their lower-ability peers who don't have access to or engage in leisure reading (Mol & Bus, 2011).

Children who read for pleasure during school in addition to reading instruction time have higher achievement than those that do not (Lewis & Samuels, 2005, cited in Allington & McGill Franzen, 2021). Lewis and Samuels's (2005) meta-analysis of 49 studies which examined the effects of providing students time to independently read during school reported moderately strong effect sizes from experimental studies which *'provided clear causal evidence that students who have in-school independent reading time in addition to regular reading instruction, do significantly better on measures of reading achievement than peers who have not' (p. 2).* Such a finding is linked to reading volume, reading engagement and Matthew effects in reading achievement and could be a way to increase reading opportunities for children from low SES backgrounds who do not have access to a wide range of books in the home.

Aspects of early reading and mathematical development have been found to influence one another. Singh et al. (2015) cited a number of studies that linked improvement in phonological skills (an aspect of reading development) to improvement in aspects of mathematics. Hecht et al. (2001) showed that phonological processing

(phonological memory, rate of access to phonological codes in long-term memory, and phonological awareness) increased early mathematics achievement and was related to mathematics computation skills.

The expectation of both parents and teachers play an important role in children's performance, with teachers holding lower expectations for lower-SES students (Wang et al., 2018). Class-level expectations have been shown to be more significant for student learning than individual student expectations (Rubie, 2007). Factors that can mediate teacher expectations include students' self-concept, their self-efficacy and their self-expectations. Moreover, in the case of low-SES students, more positive parent expectations can override low teacher expectations (Benner & Mistry, 2007).

B4.4 Literacy, Digital Literacy and Numeracy in Youthreach and Post-Compulsory Settings[47]

O'Kelly (2022) completed a systematic review of the approaches and strategies that support the literacy, numeracy and digital literacy needs of students in Youthreach and post compulsory settings. She found the need for the provision of literacy and numeracy to be rooted in the subjective context of learner's lives (Smith & Wright, 2015). She also found the need for acknowledgement of new approaches that are not tied to funding lines, metrics and student numbers. There is evidence that such ties can stigmatise and lead to disengagement. On a positive front there is evidence of the success of approaches that take cultural, gendered and contextual experiences into consideration (Eglash et al., 2013) and that engage learners in a social and collaborative learning opportunities using authentic materials and multi-modal approaches. Access to literacy and numeracy supports and appropriate approaches need to be embedded in lifelong learning (Moni et al., 2018; Lecher et al., 2021). Specifically, there is evidence that numeracy can be used for the development of self-determination skills for young adults with support needs (Eglash et al., 2013).

[47] O'Kelly, J. *A narrative review of research on Youthreach.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881241

B4.5 Factors Affecting the Literacy Development of Students from the Roma/Travelling Community[48]

Shiel and Machowska-Kosciak (2022) reviewed provision for Travellers and Roma learners. Outcomes for these learners have been disappointing and a multi-agency approach is required to address factors outside and within schools impinging on learner access, engagement, participation and benefit. Limited research was found in the area and given the extent of the disparity in outcomes with peers it is an area that requires prioritisation in this regard. It is recommended that further research into education initiatives and supports for the Roma and Traveller community on the implementation of interventions on a larger scale, would provide clearer information for improving student education in the future, particularly in relation to specific literacy and numeracy interventions, for example, building on the action research in literacy instigated by NEPSs. From the limited literature a number of key recommendations are made. Promoting access to early childhood education is vital in terms of early intervention which needs to take into account the nomadic nature of some members of the community (Lauritzen & Nodeland, 2018; Aguiar et al., 2020). A rights-based approach incorporating access to resources to address socio-economic disadvantage that moves with families is needed. In order to address the communication and language challenges that may be present for some learners, mediators such as teaching assistants, preferably Roma or Travellers should work collaboratively with teachers, parents and students (Salgado-Orellana, de Luna & Sánchez-Núñez, 2019). Involving parents and supporting families through family literacy programmes and supporting transition to post primary needs to be developed further (Rose, 2013; Department of Justice and Equality, 2017).

In schools, language support for students and parents is essential in ensuring access to the curriculum and in fostering inclusion in school communities (Aguiar et al., 2019; Heltai, 2020) There are implications for initial teacher education in understanding the unique cultural values of Roma and Travellers, intercultural education and how best to support their literacy and numeracy development. There are also implications in relation to curriculum development and the visibility of Traveller and Roma history and culture in the curriculum. There are also opportunities with proposals for increased

[48] Shiel, C., & Machowska-Kosciak, M. (2022). *Factors affecting the literacy development of students from the Roma/Travelling Community. A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7884013

discretionary time in the primary curriculum for schools to develop more creative approaches to valuing and recognising Traveller and Roma culture to increase the sense of belonging and inclusion in the school environment and curriculum (Kennedy & Smith, 2019; Salgado et. al, 2019).

Traveller education has been identified as an area that suffered cutbacks during the recession and also many Travellers and Roma learners faced particular challenges during school lockdowns in accessing, participating and benefiting from online learning. There is a strong rationale for a much more targeted, multi-agency, trans-disciplinary and whole-of -government approach to holistically supporting families which would include literacy, numeracy and wellbeing.

B4.6 Best-evidence Literacy Instruction and Intervention for Students with Additional Learning Needs[49]

Reynor (2022) reviewed the most effective instructional strategies, methods, and interventions including technology applications, for developing and supporting reading and writing skills for children and adolescents (9–18-year-old) with learning disabilities. By far the most effective reading interventions for struggling readers (e.g., 9-18 years) are multicomponent interventions consisting of foundational skills (e.g., phonics, word recognition and fluency, text reading fluency) as well as comprehension strategies and vocabulary development. Such interventions predicted significant effects for both comprehension and foundational outcomes (Donegan & Wanzek, 2021). It was also found that small group reading interventions showed significant effects on comprehension. A range of meta-analyses found that duration of intervention does not appear to moderate student outcomes (Flynn et al., 2012; Scammacca et al., 2015; Wanzek et al., 2013). This suggests that shorter, more intense reading interventions are more effective than extensive interventions. The importance of specialist training for teachers in delivery of these interventions was noted (Scammacca et al., 2015). The most effective fluency interventions included a range of strategies such as echo reading, repeated reading and choral reading with teacher modelling. One to one teaching with an adult or peer coaching showed higher effect sizes than small groups (Hudson et al., 2020). Growth in fluency was associated with improved reading comprehension in many studies (Kim et al., 2017). Among the most effective

[49] Reynor, E. (2022). *Best-evidence literacy instruction and intervention for students with additional learning needs (8-18 years)*. *A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7882162

comprehension strategies were summarisation strategies, self-monitoring techniques (Solis et al., 2012; Stevens et al., 2019) and teaching inferencing skills (Ellman, 2017). The importance of explicit instruction in comprehension skills was emphasised in these meta-analyses. Examining effective instruction strategies for writing, Gillespie & Graham's meta-analysis (2014) found that teaching strategies such as writing strategy instruction, goal setting, and process writing had a statistically significant effect on the quality of writing.

Vocabulary interventions have been shown to improve reading achievement including reading comprehension in past reviews of evidence-based interventions for adolescents with LD (Scammacca et al., 2007). Effective vocabulary teaching strategies included word mapping strategy (WMS) with use of graphic organisers (Kuder, 2017). Peer mediated methods such as peer-tutoring and collaborative strategic reading (CSR) were also effective strategies for vocabulary development (Connor et al., 2014).

Spelling is important to both reading and writing (Graham & Santangelo, 2014). Meta-analyses of effective spelling intervention reveal that there was no significant influence of memorisation intervention on spelling outcomes (Galuscha et al., 2020). Additionally, phonics instruction was *not* more effective than morphological intervention, even in the early years. Phonics, orthographic and morphological interventions showed significant effects on reading and spelling outcomes which have significant support in the literature (Castles et al., 2018). Generally, there were moderate effect sizes for group spelling interventions indicating that small group instruction tends to be particularly effective (Wanzek et al., 2016).

Cheung and Slavin (2013) found some evidence that technology applications for struggling readers may be more effective with younger students than older students (Torgesen et al., 2007). They found that high-intensity programs had a bigger impact on struggling readers than did low-intensity programs. The majority of these were high-intensity programs that combined technology and nontechnology components e.g., programmes that were well integrated with classroom instruction and took place in small groups.

Overall, intervention findings indicate that there is a need for targeted instruction that is data-based at the Tier 2 level of intervention (Fuchs et al., 2017; Lemons et al.,

2016) with teacher training in the components of small-group interventions important for the effectiveness of interventions (McMaster et al., 2018). Use of data-based individualisation (DBI) of intervention including close monitoring of progress for students with literacy difficulties is crucial (Filderman et al., 2018; Fuchs et al., 2014; McMaster et al., 2021). Finally, preservice and in-service teachers require knowledge of designing explicit reading and writing instruction and intervention, how to use literacy assessments to individualise instruction for students and to determine whether they are responding adequately to such intervention (Wanzek et al., 2016).

B4.7 Supports for Learners with Mathematical Difficulties, with Dyscalculia and Developmental Disabilities [50]

Travers (2022) reviewed how learners who experience difficulties learning mathematics can be supported in developing numeracy skills and in addition how learners with autism or with an intellectual disability can be supported in developing such skills in mathematics and across the curriculum. A number of key findings were highlighted. These included an emphasis on strong core pedagogy in whole class teaching (Dennis et al.,2016); targeted small group interventions (Monei & Pedro, 2017); the importance of prevention and early intervention (Nelson & Powell, 2018); the importance of counting in early number development (Nelson & McMaster, 2019); the use of technology (Monei & Pedro, 2017); the benefits of cross age tutoring (Alegre et al., 2019); and fraction (upper primary) and algebra interventions (post-primary) (Ennis & Losinski, 2019; Lewis & Fisher, 2016).

There is limited research specific to learners with autism and mathematics. As autism encompasses a spectrum, the mathematical profile for autistic students is not unexpectedly highly variable. While some learners show evidence of mathematical giftedness often in the calculation domain there is also evidence of many autistic learners underperforming in mathematics. An area highlighted in this regard is the application of mathematics to word problem solving. A number of teaching and learning strategies have been identified as supportive of learning for autistic students in mathematics (Cox & Jimenez, 2020).

---

[50] Travers, J. (2022). *Review of supports for learners with learning difficulties in mathematics, with dyscalculia and developmental disabilities. A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881224

For learners with more complex developmental needs the findings highlighted techniques such as systematic instruction, task-analytic instruction, system of least prompts, constant time delay, simultaneous prompting to be successful teaching strategies. The use of concrete materials and for some learners the use of virtual manipulatives have also been shown to be effective supports for learning key mathematical concepts. The use of instructional technology, computer assisted, augmented reality and video modelling have an emerging research base (Bowman et al., 2019; Cox & Jimenez, 2020).

Dowker (2019) identified the following features of successful interventions: they should include assessment of the learners' current mathematical performance and develop a profile of strengths and areas for development; adopt a developmental approach and use knowledge of learning trajectories for key areas; careful planning; professional development for staff involved and use of games to increase motivation and to reduce fear and anxiety.

B4.8 Addressing the Learning Needs of Children with Vision Impairment (Douglas et al., 2019)

Evidence in relation to the effectiveness of literacy and numeracy interventions for students with a vision impairment is slight. However, Douglas et al. (2019, p. 103) argue that educational practices have demonstrated the value of many interventions. In this context they recommend that "practitioners must design broad interventions based upon the evidence and practice available, and then modify and adjust that intervention based upon assessment of progress."

Douglas et al. (2019) draw a distinction between access to learning and learning to access in relation to print. Access to learning includes the preparation of bespoke materials, the use of low vision devices and technology, the teaching of braille as well as the use of speech technology. For writing, the use of scribes, touch typing, computers with access technology are recommended. In reviewing interventions, a key theme is the need to tailor the particular media for access and participation be it, augmentative and alternative communication, braille, moon or print. Additional themes include a responsive learning environment and persistence and collaboration with the learner and family.

In relation to mathematics the literature reports a number of successful interventions using specialist technology including specialist braille codes (Nemeth Code). Auditory feedback/listening skills were used in a number of interventions (Douglas et al., 2019).

In relation to the key decision for a child with vision impairment around their route to literacy, print, braille or both they summarise the that “this decision is in inherently difficult and is affected by a number of considerations, for example the degree of vision loss, prognosis, efficiency of vision use and parental preference” (p. 46). The research evidence suggests “there appear to be advantages of introducing contractions from the beginning, or first teaching the uncontracted/alphabetic braille and then introducing the contractions when children are older” meaning there is no conclusive evidence on best timing in this regard (p.60).

Douglas et al. (2019) also outline how the use of refreshable braille technology has not been evaluated in any great detail in terms of intervention studies. However, they make a number of observations based on current knowledge that the technology has no negative compact on literacy learning and that it has pedagogical and practical advantages as a writing devise and in giving access to large volumes of reading materials.

Both braille and print literacy are successful pathways for many learners with vision impairment. In relation to print the modifications required vary from one student to another be it adjustment of the printed materials, or the use of digital and optical magnification (Douglas et al., 2019).

For students with vision impairment and complex needs the evidence base is limited but some studies highlight the successful use of augmentative and alternative communication, braille, Moon and print for such learners (Douglas et al., 2019).

B4.9 Strategies to Support Literacy Development for Deaf and Hard of Hearing Children [51]

Mathews (2022), in a review of effective strategies to support Deaf and Hard of Hearing children, also found a lack of evidence due in part to research design and

[51] Mathews, E. (2022). *Strategies to support literacy development for deaf and hard of hearing children*. *A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881217

gaps in particular areas, for example in writing. She found an emerging evidence base for two strategies - Visual Phonics and Foundations for Literacy (Trezek & Mayer, 2019). There is a growing consensus that DHH children follow the same overall trajectory in reading development as their hearing peers, but they may require different instructional strategies. Explicit instruction across all components of literacy is likely to be beneficial. Phonology (either sound OR sign based) is necessary for children to become proficient readers. However, it is not sufficient on its own (Alasim & Alqraini, 2020; Andrews & Wang, 2015).

Though phonological awareness and decoding are sometimes noted as inconsistent predictors of reading achievement, phonological awareness training may be beneficial, even for those with poor auditory access if it is combined with visual supports (e.g., Visual Phonics). Morphology is more regular than phonology and direct instruction may be beneficial (Trussell & Easterbrooks, 2017).

Visual supports may be helpful in developing various areas of literacy (e.g., natural sign languages for overall vocabulary development; Visual Phonics for phonological awareness; visual supports in writing development; fingerspelling/manually coded English /simultaneous communication for morphographic instruction).

Vocabulary development may be supported by repeated reading with structured instruction (Crowe & Guiberson, 2019; Davenport et al., 2019; Wang & Williams, 2014). Enhanced storybook interaction and shared reading may be beneficial (Crowe & Guiberson, 2019), especially for pre-school children (Entwisle et al., 2016) and for DHH English-language learners (Cannon & Guardino, 2012). Peer language modelling may also benefit DHH pupils' language development (Crowe & Guiberson, 2019).

Tentative evidence exists for a range of reading comprehension approaches including explicit instruction, story grammar instruction, modified Directed Reading Thinking Activity, activating background knowledge, and use of well written, high-interest texts (Wang & Williams, 2014). Other strategies such as the Comprehension, Check and Repair strategy have had positive findings but does not constitute an evidence-base (Crowe & Guiberson, 2019).

While many interventions have positive findings in the research, they do not reach the threshold for an evidence base. Arguably the two most promising interventions are

Visual Phonics and the Foundations for Literacy programme (Trezek & Mayer, 2019) for pre-schoolers (Entwisle et al., 2016), including those without functional hearing who receive support through Visual Phonics (Davenport et al., 2019).

Assessment methods used for hearing children are not always appropriate for DHH children (e.g., Fluency/sign aloud are not equivalent)**.** In spite of its importance, reading comprehension has received less attention in the research. Only tentative evidence exists for a range of comprehension strategies including explicit instruction, story grammar instruction, modified Directed Reading Thinking Activity, activating background knowledge, and use of well written, high-interest text.

There is very scant research on strategies for writing. From the limited research available, the most compelling evidence is in teaching the process approach from an intervention designed by Wolbers called the Strategic and Interactive Writing Intervention (SIWI) as well as Focus-on-Form methods.

B4.10 Addressing the Needs of High-Achieving and Highly Able Students in Literacy and Numeracy [52]

Shiel and Pitsia (2022) conducted a review of issues pertaining to high achieving and highly able students in literacy and numeracy. The results of recent international assessments in which Ireland has participated, including PIRLS 2016 and TIMSS 2019 (Grade 4), and PISA 2018 (15-year-olds) suggest that the proportions of highly able students are broadly along expected lines for reading literacy (given Ireland's average performance, as well as performance relative to other countries), and below expectations for mathematics (and science) (Pitsia & Lysaght, 2021). In PISA 2018 mathematics, just 8.2% of students in Ireland performed at the highest proficiency levels (Levels 5-6), compared to an OECD average of 10.9%, despite Ireland's above average performance in mathematics. Although there is now broad recognition by educational authorities of the need to raise the performance of high achievers in Ireland, with the establishment of specific targets in the Interim Review of the National Literacy and Numeracy Strategy (DES, 2017a), no concrete initiatives have been put in place within the education system to raise standards, other than those related to curriculum development in general, and then mainly at Junior Cycle (Pitsia & Lysaght,

[52] Shiel, G., & Pitsia, V. (2022). *Addressing the needs of high-achieving and highly able students in literacy and numeracy. A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881210

2021). They note that lack of adequate provision militates against efforts to build the type of knowledge society that Ireland aspires to become (e.g., Government of Ireland, 2018), which requires cohorts of strong performers in mathematics and other STEM subjects (science, technology, and engineering). Underperformance in mathematics is particularly problematic, given that proficiency in mathematics can drive performance in other STEM subjects.

A number of authors have defined the characteristics of highly able students. In literacy, these include high levels of engagement, monitoring of reading comprehension, access to linguistically rich texts, and deployment of a range of strategies in response to the particular demands of texts (Abilock, 1999). In numeracy, they include ability to think logically and symbolically about quantitative and spatial relationships, ability to perceive and generalise about mathematical patterns, structures, relations and operations, and flexibility and reversibility of mental processes in mathematical activity (House, 1987, cited in Bicknell, 2008). Pitsia (2021) examined variables associated with high achievement in international assessments. Drawing on the data for PISA 2018 mathematics in Ireland, she used multi-level modelling to identify variables associated with high achievement (performance at Levels 5-6). Variables that were positively associated with performance included economic, social and cultural status (the PISA variable for SES), self-efficacy in mathematics and openness to problem solving. Anxiety about mathematics was negatively associated with high achievement.

Although services are provided for gifted students in mathematics and related areas by entities such as the Centre for Talented Youth, Ireland at Dublin City University, these typically involve relatively small proportions of students, usually the strongest performers on tests of general ability. While many students involved in the work of CTY-Ireland are also likely to perform strongly in reading literacy and mathematics, there is a larger group, comprising of about 10%-15% of students, who are high achievers, or have the potential for high achievement in literacy and numeracy The performance of high achievers needs to increase, and more students need to move into the high achiever bracket, especially in mathematics. This needs to occur early, and it needs to continue through post-primary schooling. A two-pronged approach is required – one focusing on extending the performance of higher-achieving students, and the other on raising overall standards at national level. The challenge in

raising overall standards is underlined by the fact that average performance on PISA mathematics in Ireland in 2018 was similar to 2003, 2006, 2012 and 2015 (i.e., despite the implementation of Project Maths in all schools from 2010 onwards and the carrot of bonus CAO points).

There is limited evidence on the effectiveness of interventions to support high-achieving and/or gifted students, especially those living in disadvantaged circumstances (Montacute, 2018). In their systematic reviews of the effectiveness of interventions designed to accelerate performance, several researchers did not report on effect sizes because of concerns about the quality of the studies they had reviewed (see García-Martínez et al., 2021; Bailey et al., 2012), with general principles underpinning effective interventions presented instead.

Where disadvantage is concerned, four approaches to supporting highly able students were identified by Cullen et al. (2018) in England – academic extension, cultural enrichment, personal development, and the removal of financial barriers to achievement. Cullen et al. also emphasised the importance of strong leadership, and implementation of a strategic focus for those with the potential for high achievement.

García-Martínez et al. (2021) identified a variety of didactic strategies and models designed to meet the needs of gifted students, including acceleration, enrichment and extension programmes. They also noted a pressing need for research on the effectiveness of individualised adaptations focusing on the needs and interests of gifted students (rather than the implementation of generalised approaches). Bailey et al. (2012) focused on the different settings in which gifted students were offered support, and concluded that in-school programmes were likely to be more effective than external programmes, such as special schools for gifted and talented students. Among the in-school programmes were streamed classes (such as classes at a higher grade level) that provided G & T students with an enriched learning environment adapted to their needs (a ‘vertical curriculum’ approach), and mixed ability classes, where differentiated activities were provided for G & T students. Bailey et al. also noted the value of teaching specific strategies to enhance gifted and talented students’ learning and engagement, such as self-regulation and higher-order thinking skills, and the key role of teachers in generating and sustaining the social contexts in which gifted and talented students learn. In her meta-analysis, Kim (2015) reported that enrichment programmes, which typically focused on teaching higher-order skills, had a strong

average effect (0.96) on performance in areas such as reading literacy and mathematics. After the exclusion of one problematic study, Steenbergen-Hu and Moon (2011) reported an effect size (g) of 0.18 for acceleration programmes, which included early kindergarten/school/college entrance, subject matter acceleration, advanced placement and curriculum compacting, though the authors noted that none of these had been unambiguously defined.

Specific strategies that have been implemented in effective literacy and numeracy programmes for highly able students include use of more complex texts and an emphasis on inferencing and higher-order thinking skill to improve critical thinking in literacy, a strong focus on real-life problem solving in numeracy, and the development of self-regulation and metacognitive skills as cross-curricular skills. The use of ICTs has not, as yet, featured strongly in the literature on supporting highly able students, though this may reflect a time lag between the publication of individual studies and the subsequent publication of systematic reviews.

B5. Continuous Professional Learning and/or Development [53], [54]

B5.1 Professional Learning and/or Development (PL): Principles and Practices

B5.2 Professional Development for Leaders and Specific Contexts and Disciplines

This section summarises key findings and recommendations from a review of reviews related to *B5.1 Professional Learning (PL): Principles and Practices* (King, French & Halligan, 2022); and *B5.2 Professional Development for Leaders and Specific Contexts and Disciplines* (Giblin, McCormack, Ó'Breacháin & Ryan, 2022[55]). Noteworthy is that literature related to PL is "partial in its coverage, is fragmented and is under-theorised" (Kennedy, 2014, p. 689). Current gaps in this review of reviews include: reviews of PL and leadership specific to the disciplines of literacy, numeracy and digital literacy (Giblin et al., 2022); reviews of PL and Gaeilge or PL and digital literacy (Giblin et al., 2022); reviews based on longitudinal studies showing impact and

[53] King, F., French, G., & Halligan, C. (2022). *Professional learning and/or development (PL): Principles and practices*. *A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7882155

[54] Giblin, F., McCormack, M., Ó'Breacháin, C., & Ryan, M. (2022). *Professional development for leaders and specific contexts and disciplines: Literacy (including Gaeilge and digital literacy) and numeracy. A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7882171

[55] With thanks to Dr. Fiona King, DCU, IoE for leading this section.

sustainability of PL over time (King et al., 2022); reviews of teacher identity and PL (King et al., 2022); reviews considering the 'complex theory of teacher learning-practice' to inform PL design, implementation and evaluation (King et al., 2022), which 'is nothing short of an ethical imperative' (Strom & Viesca, 2021, p. 209). Nevertheless, this review offers some key learnings and insights for consideration. Findings herein related to PL generally may be informative for supporting leadership to implement change in specific contexts and disciplines. Please note, for simplicity, the term 'teacher' applies to those working in the range of educational settings: early childhood education and care (ECEC), primary and post primary.

The terms CPD, 'professional development' and 'professional learning' (PL) are often used synonymously. However, this review intentionally uses 'professional learning' (PL) to account for professional development experiences, activities, workshops or programmes that teachers in early childhood settings and schools engage with that may lead to teacher PL (Boylan et al., 2018; King, 2014). In this way PL is an outcome from engaging with professional development (Liou & Canrinus 2020). Therefore, PL is not something that is "done" to teachers (Timperley et al., 2007, p. 233), rather it involves teachers as active participants responsible for their own learning (Labone & Long, 2016). PL can be formal (arising from professional development workshops, courses…) or informal (for example, on-the-job learning from social interactions with others) (Spillane et al., 2011). This understanding of PL aligns with the Cosán Framework for teachers' learning (Teaching Council, 2016) and reflects the key elements of teacher agency and autonomy, and collaborative and reflective practice for transformative learning outlined in Kennedy's (2014) models of PL (see Table 1, King et al., 2022). This understanding of PL could also allow for adherence to the recommendations in the context of ECEC for a national infrastructure and quality assurance (Department of Children, Equality, Disability, Integration & Youth [DCEDIY], 2022).

The factors that shape teacher learning and practice are not neutral and need to be explored (Strom & Viesca, 2021) as the interconnectedness between the systems and policies within which teachers operate influences their learning (Goldsmith et al., 2014; Ciesielski & Creaghead, 2020; Giblin et al., 2022). Kennedy's (2014) frameworks of analysis for understanding the purpose of various PL models (see Table 1, King et al., 2022) and for understanding aspects of the Irish policy context at the micro, meso

and macro levels against perspectives on professionalism in the Irish context (see Table 2, King et al., 2022) should be explored by those planning PL. Adopting any PL model from other contexts uncritically and applying it as “policy borrowing rather than policy learning” is cautioned (Jones, 2021, p.197).

The reviews point to core design features of PL for consideration: content focus; active learning; collective participation; coherence; and duration (Desimone, 2009). Reviews also call for a focus on participants’ needs, the role of external providers and specialists, and leadership for PL (Cordingley et al., 2015b), models of effective practice, coaching and expert support, and feedback and reflection (Darling-Hammond et al., 2017). However, the reviews stress the importance of conceptualizing teacher learning as a “complex system rather than as an event” (Opfer & Pedder, 2011, p. 378) to understand which core features work, when, where and why (Desimone & Garet, 2015). An exploration of Strom & Viesco’s (2021) framework of teacher learning (Table 3, King et al., 2022) would provide some key understandings and suggestions for the complex nature of teacher learning-practice. Teacher learning-practice is often thought of as “linear and process-product driven” (Strom & Viesco, 2021, p. 209) when in reality much evidence points to the need to consider various mediating factors and influences, for example, between the teacher, practice, students and external stimuli (Clarke & Hollingsworth, 2002), the PD programme/activity, support, and teacher agency (King, 2014, 2016), teacher identity, understanding change processes and wider social forces (Boylan et al., 2018) .

Missing from the reviews is an emphasis on empowering teachers (King, 2019) to understand and navigate this complexity, pointing to the need for consideration of empowerment to support teachers to implement change at the individual, community and organisational level (Ruechakul et al., 2015). This requires an understanding of the relationship between the individual teacher, the school/organisation and the activity or design of the PD experience (Lee et al., 2020; Opfer & Pedder, 2011). This reflects the importance of the situated nature of teacher learning and understanding change (King et al., 2022; King & Holland, 2022). Empowering teachers in this way supports their leadership in improving pedagogy, student learning, and educational reform and improvement in teaching (Poekert, 2012).

The core design features of PL are evident in the reviews focused on the practices of professional development/PL, where there is a significant focus on teacher

learning as being socially constructed through collaborative practices (Brunsek et al., 2020; Dille & Rokenes, 2021; Eisenschmidt & Niglas, 2014; He et al., 2020; Lantz-Andersson et al., 2018; Lefstein et al., 2020; Saifuddin & Majbrit, 2016; Vangrieken, et al., 2016), including but not limited to, teacher networks, teacher communities, collaborative inquiry, peer observation/coaching, research-practice partnerships (school-university), communities of practice (DCEDIY, 2022), coaching and mentoring. Central to all the collaborative practices is the importance of trust and respect and creating a climate of openness, dialogue, and taking risks. Missing from the reviews is 'How' to do this (King et al., 2022).

The importance of discipline-specific content knowledge emerges strongly from the reviews (Giblin et al., 2022). Studies appear to indicate that the extent of teachers' pedagogical content knowledge in the areas of literacy and numeracy is limited. Additionally, in pre-service and in-service contexts, the systematic and explicit instruction in the provision of foundational skills in literacy and numeracy is paramount. This requires that key pedagogies and knowledge in relation to literacy, digital literacy and numeracy must be embedded in all stages of a teacher's career (Giblin et al., 2022). Adopting a multifaceted approach (Clarke & Hollingsworth, 2002) consisting of activities to develop teacher content knowledge and opportunities to collaborate with others is conducive to the iterative and reflective process of PL. Supporting teachers to develop their own sense of selves as writers or, teachers doing maths and being mathematicians in their own right, has the potential to shift their beliefs and practices and equally, develop empathy for the student learner (Giblin et al., 2022). Many of the discipline-specific and context-specific studies reported on in reviews were small scale and situated interventions (Giblin et al., 2022). While these were typically rated positively by participants, they do not present an opportunity for comparison or analysis of outcomes (Stahnke et al., 2016).

Planning and evaluating PL leads to improved teacher learning/outcomes, child/student outcomes, and the learning of others (King, 2014; Philipsen et al., 2019; Schachter, 2015; Snyder, 2012). Teacher learning is not linear and evaluation models need to account for the situated, complex, and contextual nature of teacher PL (Boylan et al., 2018; Rawdon et al., 2020). Effects on student outcomes are not straightforward but are influenced by teacher learning, changes in pedagogy and use of data in

teaching and learning (Ansyari, Groot & De Witte, 2020). The reviews point to a framework for guiding choices of tools for evaluation of PL (King et al., 2022).

The role of online/blended learning (OBL), which has been accelerated by COVID-19, has likely changed teacher PL forever (Bragg et al., 2021). Reviews highlight the potential of online learning (Surrette & Johnson, 2015), online communities of practice (Dille & Rokenes, 2021; Lantz-Andersson et al., 2018; Saifuddin & Majbrit, 2016), use of social media and video analysis for teacher PL. Drawing from multiple resources to inform designs with innovative formats for PL has been highlighted for ECEC (Schachter, 2015).

Continued investment in high-quality PL opportunities is important. Structured planning and recording time allocated to PL (DCEDIY, 2022), or release time and space for teachers to meet and to discuss their work and that of their students (De Luca et a., 2014; Ridge & Lavigne, 2020) along with time for planning change (Cordingley et al., 2015b) has been stressed. This reflects previous calls, in the Irish context, for time for critical reflection, time for learning (Sugrue, 2011), spaces and resources for learning (Kutsyuruba et al., 2020). Time alone however will not suffice, as change may appear technically simple but is socially complicated (Fullan, 2015). The importance of the complexity of teacher learning practice cannot be underestimated (King et al., 2022). The ‘how’ to plan for change and ‘how’ to empower or motivate teachers to plan for change is not evident in the reviews.

B6. Enabling Family and Community Engagement to Support Literacy, Digital Literacy and Numeracy Development for All Children

B6.1 Enabling Family Engagement to Support Literacy, Digital Literacy and Numeracy Development for All Children [56]

B6.2 Enabling Community Engagement to Support Literacy, Digital Literacy and Numeracy Development for All Children [57]

This section summarises the findings of two reviews of systematic research (B6.1; B6.2) in relation to literacy (including digital literacy) and numeracy as part of the development of a successor strategy to the National Literacy and Numeracy Strategy (2011-2020) and the Interim Review (2017). Both reviews synthesise recent research on family and community engagement in literacy, digital literacy and numeracy (LDLN) development. 'Family engagement' describes the dynamic practices and processes that schools [and early childhood settings] and families engage in as they work to promote children's development (Smith et al., 2021). Research consistently indicates that family engagement has a positive impact on children's academic outcomes (Wilder, 2014). In relation to 'community engagement' the literature evidences the adage that 'it takes a village to rear a child'. The review focuses on establishing engagement between early childhood education and care (ECEC) settings, schools, teachers, and library services to promote LDLN development in the community. The concept of community engagement is complex and recognises that such engagement is a reciprocal process underpinned by "the aspirations, concerns, needs and values of citizens and communities … in policy development, planning, decision-making, service delivery and assessment; and by which governments … involve … communities and other stakeholders in these processes (United Nations, 2005, p.1). It is therefore recognised that community engagement is a two-way process. Please note that the term 'setting' refers to ECEC settings and schools.

In relation to family engagement the effect sizes for school-based activities, such as attendance at parent-teacher meetings are much smaller than for home-based engagement practices (Jeynes, 2018). Parental style, the extent to which a parent demonstrates a supportive and helpful parenting approach (Jeynes, 2012), and

---

[56] Nic Mhuirí, S., Farrell, T., French, G, McCormack, M & Shiel., C. (2022). *Enabling family engagement to support literacy, digital literacy and numeracy development for all children*. *A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881197

[57] French, G., Farrell, T., McCormack., M., Mhuirí., S. & Shiel., C. (2022). *Enabling community engagement to support literacy, digital literacy and numeracy development for all children. A review of the literature.* Department of Education (Ireland). https://doi.org/10.5281/zenodo.7881192

discussion of school matters and emphasis on education (Tan et al., 2020) have been found to be positively associated with student achievement. High expectations, the understanding that family members will make their best effort in academic tasks has been consistently found to be the aspect of family engagement that is most highly associated with positive academic outcomes (Jeynes, 2018; Wilder; 2014; Tan et al., 2020).

Parental pessimism, where parents feel that things in general would not go their way, was found to be a significant predictor of mathematics performance (Goforth et al., 2014). Reading with children [from birth] and other home literacy activities have been found to have positive associations with children's academic performance (Van Voorhis et al., 2013). The research shows mixed findings in relation to the impact of homework (c.f., Higgins & Katsipataki, 2015; Wilder, 2014). If homework is given to school-aged children, it should be curriculum-linked, facilitate two-way communication between teachers and parents, and allow all parents to participate regardless of their knowledge of the subject (Epstein et al., 2018).

Early childhood educator and teacher education can successfully support positive attitudes towards, and knowledge of, family engagement practices (Smith & Sheridan, 2019). Teachers must be willing, and feel prepared, to engage with parents in culturally responsive ways (Anderson et al., 2017; Smith & Sheridan, 2019). In the Irish context the *Diversity, Equality and Inclusion Charter and Guidelines for Early Childhood Education and Care* (DCYA, 2026) are broadly oriented towards equity through a comprehensive Anti-bias approach to ECEC practice. The document makes reference to literacy in the context of diverse family backgrounds. The effects of comprehensive Anti-bias training on ECEC educators' behavioural change and reference to the 'variety of strategies [adults use] to support classroom communication with children whose primary language is not English is documented (Duffy & Gibbs, 2013, p.64). Collegial leadership, involving egalitarian, supportive behaviours with clearly communicated expectations for high performance, has been shown to be important for family engagement (Smith et al., 2021).

Family setting partnership interventions have been shown to have a significant positive effect on children's academic outcomes (Jeynes, 2018). Genuine collaboration, and two-way communication between ECEC settings, schools and families have been found to be key to such partnerships (Jeynes, 2018; Epstein et al.,

2018; Smith et al., 2019). Sufficient consideration should be given to the factors that affect parents' ability to engage: e.g., substandard accommodation, overcrowding, halting sites (Travellers), emergency accommodation, direct provision, family homelessness, parental illiteracy, lack of access to support services, poverty leading to and exacerbating digital inequality, to name some impediments. Pursuing equity in terms of parental involvement necessitates that existing parental resources are acknowledged by teachers and policy-makers in a meaningful way (Anthony-Newman, 2019).

Family literacy shared and dialogic reading programmes have been shown to have a positive impact on children's outcomes (van Voorhis et al., 2013), particularly in areas with socioeconomic challenges (Fikrat-Wever et al., 2021). While there is less research on numeracy, there is some evidence that home mathematics activities can have positive impacts on children's outcomes (van Voorhis et al., 2013). Bilingual family literacy programmes (Anderson et al., 2017) and programmes to support parents' learning of English have been found to have a positive effect on children's academic outcomes (Jeynes, 2012).

The benefits of successful transitions in education have long been recognised and reported. These include improved school attendance and retention; increased participation and family involvement; a more positive attitude towards school as well as a stronger sense of community (Dockett & Perry, 2013, 2014; Hirst, 2011; O'Kane, 2016). Family engagement during school/setting transitions has also been identified as an important factor in children's later academic performances (Bierman et al., 2019). Whilst most research focuses on younger children, the literature indicates that communication between teachers and family, and between parents and child remains very important for second-level students (Park & Holloway, 2013). As part of the revised DEIS a promising development provides greater emphasis on the role of the Home School Community Liaison Scheme in supporting transitions from early years to primary, primary to post-primary and post-primary to further and higher education (DE, 2019).

The literature is consistent in recognising learning as a collective endeavour, with spaces, places and people in the community playing central roles in supporting early literacy and numeracy (Shrestha Krolak, 2015; Kelly, 2006). However, community engagement and initiatives have not maintained a policy profile or priority in Ireland.

Equally, the role of community (initiatives and agencies) in supporting literacy and numeracy does not emerge strongly across the literature. Nevertheless, there are initiatives with great potential. See ‘One book, one community’ scheme (O’Brien Press, 2013); a shared reading experience on a picture book that encourages math talk (van den Heuvel-Panhuizen & Elia, 2012); digital and traditional games and community picnics (Dockett & Perry, 2014; van Oers, 2010) and the Fingal County Libraries Early Years Literacy Strategy (French et al., 2013), among others. Community engagement makes a difference. The literature suggests that communities support the development of literacy and numeracy skills, but conversely better competencies and knowledge also equip children and adults to work for change in their communities (Baker et al., 2004). Viewed in this way, the collaborative working of schools, parents and communities acts as a social leveller and a mechanism for inclusion (Anderson et al., 2017; Jeynes, 2018; Rankin & Brock, 2012), breaking down barriers and social divides. Effective mechanisms include Action Teams for Partnerships committees (Epstein, 2018), co-leadership frameworks (Trimmer et al., 2021) or collaborative family literacy partnerships (NALA, 2020).

Effective collaboration does not happen automatically and requires strong leadership and structures to enable better learning outcomes for children. Educational leaders play a pivotal role in developing family engagement by setting policy and by creating supportive environments (Smith et al., 2021), while structured initiatives (Epstein, 2018) create an enabling framework across the community (Trimmer et al., 2021). Collaborative working between home, school and community based on principles of building strengths, respect and empowerment (Blythe et al., 2013; Trimmer et al., 2021) creates overlapping spheres of influence that make a difference (Epstein, 2018, p.64) and augur well for children’s’ learning.

Part C: Recommendations for Strategy Pillars

The recommendations arising from the 27 systematic reviews (B1-B6) appear under the pillars of the original National Literacy and Numeracy Strategy. Within each pillar, recommendations are grouped under major categories such as Early Childhood Education and Care, Primary and Post-Primary Levels, with Literacy, Numeracy and Digital Literacy separated where relevant.

Where references appear in a recommendation, they can be found in the associated report. A list of reports is given after the table of contents.

Pillar 1: Enabling Families and Communities to Support Children's Literacy Development

Early Childhood Education and Care

- *Early childhood educators and teachers must recognise that all families can, and do, support the education of their children. Positive attitudes toward family engagement and sense of efficacy in relation to family-engagement practices across literacy, digital literacy and numeracy must be promoted and progress through ECEC and initial and teacher education and professional development (Smith & Sheridan, 2019). Relevant elements of such education should include: communication strategies, cultural awareness/working with diverse populations, family-engagement attitudes/beliefs, and parent-educator relationships (Smith & Sheridan, 2019; Anthony-Newmann, 2018).* [Report B6.1]

- *To narrow the achievement gap, policy-makers should develop policies to enhance the language, literacy and mathematical development of children from birth, which involves including children's families (Linder et al., 2013; Mol & Bus, 2011) and promoting high quality ECEC (Larson et al., 2020).* [Report B4.1]

- *It is essential that early childhood educators and teachers are enabled to engage in effective, authentic and respectful relationships with parents (Ma et al., 2015). Settings should develop culturally responsive family engagement practices to encourage the participation of all families. Such programmes might include bilingual family literacy programmes and/or provision of language-support for parents where appropriate (Anderson et al., 2017; Jeynes, 2012). Initiatives involving conversational strategies are proposed by Van Voorhis et al. (2013). Mathematics programmes, in particular, should include growth-mindset messages for parents and children (Goforth et al., 2014).* [Report B6.1]

- *Parents and educators should engage in shared dialogic book reading (Wasik et al., 2016) and "start a reading routine early in children's development" to familiarise children with books and reading material generally (Mol & Bus, 2011, p.287).* [Report B4.1]

- *In general, family engagement programmes addressing literacy, digital literacy and numeracy should be developed using a partnership approach to address local needs (Jeynes, 2018; Smith et al., 2019). Such an approach will be grounded in two-way communication between families and school/setting staff and will use evidence-based activities (such as dialogic, shared reading or growth mindset messages) in flexible ways to suit the local context.* [Report B6.1]

- *It is recommended to add comprehensive parent programmes, in particular building positive parent-child relationships and exposure to reading materials in the home environment (Linder et al., 2013). Additional educator professional development enhancements (Ciesielski & Creaghead, 2020; Markussen-Brown et al., 2017) should include content-rich skill-based curricula in language, literacy and mathematics in ECEC programmes which are appropriate to the context of children's development. These should incorporate play and fun experiences that will influence young children's later achievement (Joo et al., 2018).* [Report B4.1]

- *Technology and digital tools can be used to support family engagement in their children's learning (Van Voorhis et al., 2013). Technology may support the two-way flow of information between parents and early childhood educators and teachers and/or the provision of family engagement programmes and resources.* [Report B6.1]

Primary and Post Primary: Literacy

- *Strong links should be forged between the use of Irish at home, school and in the community to increase the use of Irish particularly in all Irish-medium and Gaeltacht settings (DES, 2016a, Hickey & de Mejía, 2014; Ó Duibhir, 2018; 2017). Parents should be encouraged to read in Irish to their children and this could be supported by technology (Stenson & Hickey, 2019).* [Report B1.4]

- *Parents and educators should engage in shared dialogic book reading (Wasik et al., 2016) and "start a reading routine early in children's development" to familiarise children with books and reading material generally (Mol & Bus, 2011, p.287).* [Report B4.1]

Primary and Post Primary: Numeracy

- *Parents should be encouraged to become involved in all aspects of their child's education, especially mathematics (Ramirez et al., 2013; Fan et al., 2017; Choi & Han, 2020).* [Report B2.1b]

- *Parents should be involved in identifying highly able students, and in supporting them to reach their potential, in partnership with schools (Cullen et al., 2018; Montacute, 2018).* [Report B4.10]

- *Schools should explore the community as a context for the rich and meaningful development of numeracy by students (McDonald & Smith, 2020; Merritt et al., 2017; White & Delaney, 2021).* [Report B2.3]

- *Schools should draw on and facilitate interaction with individuals/organisations in the community who can demonstrate their everyday use of numeracy (Belbase et al., 2021; White & Delaney, 2021).* [Report B2.3]

Youthreach

- *Social policy should form the context of specific educational policy on literacy and numeracy that addresses social and economic issues that impact on families, communities, school engagement and completion (Borgna, 2017).* [Report B4.4]

Travellers and Roma

- *Further research into education initiatives and supports for Travellers and Roma on the implementation of interventions on a larger scale would provide clearer information for improving student education in the future, particularly in relation to specific literacy and numeracy interventions e.g., building on the NEPS action research projects.* [Report B4.5]

- *Promoting access to early childhood education programmes will inform families of the educational benefits of such programmes (Lauritzen & Nodeland, 2018; Aguiar et al., 2020). Taking into account the nomadic nature of some members of the Roma and Irish Travelling community, access to ECEC programmes should be promoted by community liaisons. This may result in a need to connect families with early childhood education providers in different localities (Kennedy & Smith, 2019).* [Report B4.5]

- *The curriculum should include aspects of Roma history and culture. Educators should implement 'intercultural education policies' to ensure Roma and Irish Traveller cultures are represented well and respected in the school environment and curriculum (Kennedy & Smith, 2019; Salgado et. al, 2019).* [Report B4.5]

- *Access to resources for Travellers and Roma students should be targeted at those with socioeconomic disadvantage, and this support needs to follow families as they move from one location to the next (Lauritzen & Nodeland, 2018; Kennedy & Smith, 2019).* [Report B4.5]

- *Mediators in education, such as teaching assistants, should be appointed to work collaboratively with teachers, parents and students (Ram 2015). The 'teaching assistant' preferably should be a member of the Roma or Travelling community to promote belonging and connection between the child and the school (Salgado-Orellana, de Luna & Sánchez-Núñez, 2019).* [Report B4.5]

- *Supporting families through parental involvement, especially in the early years and transition to second level, is essential for promoting the development of Roma and Traveller children's language and literacy e.g., family literacy programmes (Rose, 2013).* [Report B4.5]

- *The best ways to support transitions to second level should be explored in an Irish context (European Union Agency for Fundamental Rights, 2016, cited in Kennedy & Smith, 2019; Department of Justice and Equality, 2017).* [Report B4.5]

Low SES

- *Literacy programmes need to be designed to meet the needs of local communities (Graham et al., 2018; Toste et al, 2020) and should incorporate understanding of students' contexts and backgrounds.* [Report B1.3]

Family and Community

- *Family engagement interventions should target home-based activities in addition to school-based involvement (Epstein et al., 2018; Jeynes, 2018; Tan et al., 2020; Van Voorhis et al., 2013).* [Report B6.1]

Pillars 2 and 3: Improving Teachers' and ECEC Practitioners' Professional Practice and Building the Capacity of School and ECEC Leadership

The following recommendations pertain in many instances to both teachers and leadership teams in early years' settings and schools and so are combined in order to avoid repetition. Therefore, the term 'teacher' is used for those who work in the range of settings, unless otherwise specified. These recommendations mainly arise from systematic reviews B5.1 and B5.2.

- *Adopt the term 'professional learning' (PL) to account for teacher learning that may arise from the range of professional development experiences, activities, workshops or programmes that teachers in schools and early childhood settings engage with (Boylan et al., 2018; King, 2014). PL can be formal (arising from professional development workshops, courses…) or informal (arising from on-the-job learning from social interactions with others…) (Spillane et al., 2011). PL is not something that is "done" to teachers (Timperley et al., 2007, p. 233); it is an outcome from teachers actively engaging with professional development. The Cosán framework for teachers' learning (Teaching Council, 2016) aligns with this understanding of teachers' PL and reflects the key elements of teacher agency and autonomy, collaborative and reflective practice which are necessary for transformative learning (Kennedy, 2014). PL should be considered as a continuum, where a teacher's own professional knowledge develops as the teacher moves through a number of learning stages of their career (Huberman, 1988), ultimately aiming towards leadership in teaching and learning (Poekert, 2012). However, teachers' learning will vary according to their relationship with their school and community context (Opfer & Pedder, 2011).* [Report B5.1]

- *Policy-makers should engage with Kennedy's (2014) framework of analysis for understanding aspects of the Irish policy context at the micro, meso and macro levels, against perspectives on professionalism in the Irish context to ensure alignment between the two (see Table 2, King et al., 2022). Professional developers and all those involved in planning PL should also engage with Kennedy's (2014) framework of analysis for understanding the purpose of various PL models (see Table 1. King et al., 2022). (Pillar 2: Teachers and ECEC PL; Pillar 3: School and ECEC leadership). (King, French & Halligan, 2022).* [Report B5.1]

- *In line with the Looking At Our School policy framework (DES, 2022), school leadership and management should 'develop leadership capacity' (p.14) by "empower[ing] teachers to take on leadership roles and to lead learning" (p. 41). Empowering teachers to become teacher leaders to support the PL of colleagues (Muijs et al., 2014; Sebastian, Allensworth, & Huang, 2016) and influence others to implement change at the individual, community and organisational levels (Ruechakul et al., 2015) is central to developing PL cultures in schools and also reflects the concept of teacher agency that features prominently in the NCCA's Primary Curriculum Framework (2020). Establishing a Leadership for PL course/programme ought to be considered to equip teachers with the necessary leadership skills to lead the PL of others (Audisio et al., 2022) and to address issues such as power inequalities identified by Nguyen (2021) linked with situated and contextual PL. Noteworthy also is the importance of developing social capital by "creates[ing] and motivates[ing] staff teams and working groups to lead developments" in PL (DES, 2022, p.41), to be responsible for leading PL and understanding and supporting the complexity and contextually situated nature of teacher learning (Opfer & Pedder, 2011) and practice (Strom & Viesca, 2021: Table 3; King et al., 2022). Collaborative cultures are seen as a cornerstone for implementing and sustaining new practices for school improvement (King, 2014, 2016). Leadership for PL needs to account for the relationship between the individual teacher, the school/organisation and the design of the PL experience (Lee et al., 2020; Opfer & Pedder, 2011) whilst also understanding which of the core features of effective PL (outlined in the summaries and full reports) work, when, where and why (Desimone & Garet, 2015).* [Report B5.1]

- *A focus on planning and evaluating PL to improve teacher learning, child/student outcomes, and the learning of others (King, 2014; Philipsen et al., 2019; Schachter, 2015; Snyder, 2012). Teacher learning is not linear and does not automatically result in enhanced student outcomes. Therefore, all those involved in PL (e.g., DES, leaders and teachers) need to adopt tools for planning and evaluating formal PL to account for the situated and contextual nature of teacher PL (Boylan et al., 2018). Rawdon et al., (2020) in the Irish context along with other researchers (see full report by King et al., 2022) point to a framework for guiding choices of tools for planning and evaluating teacher PL.*

Of importance here is that some frameworks reflect a linear pattern of teacher learning and solely focus on establishing cause and effect between professional development experiences and teacher PL and student outcomes, whilst forgetting the important affective element in teacher PL (King, 2014). For example, emotions (fear, anxiety, motivation, excitement, expectations), self-efficacy and other affective aspects (attitudes, beliefs, reflections and values) of teacher and leaders' learning have been shown to directly influence teachers' and leaders' engagement with PL and cognitive and behavioural outcomes arising from the PL (King, 2014; OECD, 2020; Rawdon et al., 2020). Planning and evaluation frameworks of PL need to account for the cognitive, emotional and social involvement of teachers (Liou & Canrinus, 2020) in the PL process for change. [Report B5.1]

- *Draw on evidence-based models when designing professional learning: experiential learning (Kraft et al., 2018), active learning (Blitz, 2013 Ciesielski & Creaghead, 2020; Edwards, 2021; Cremin, 2017), collaborative learning (Desimone, 2009; Huang & Shimizu, 2016) (including PLCs, CoPs and communities of inquiry), coaching (Eleck & Page, 2019) and mentoring (Kutsyuruba et al., 2020) have been endorsed in the literature as models that support teacher learning in context.* [Report B5.2]

- *Efforts should be made to ensure that teachers' engagement with PL is not undermined by an over-emphasis on high-stakes testing and accountability (Sigvardsson, 2017).* [Report B5.2]

- *Endorse PL practices that consider the contextually situated and socially constructed nature of teacher learning through collaborative practices, for example, the 'infinite potential' of school university research-practice partnerships (He et al., 2020) where researchers and practitioners engage in long-term problem-solving reciprocal collaborations. Teacher communities (Vangrieken et al., 2016), Professional Learning Communities (PLCs) (Richmond & Manokore, 2011) and collaborative inquiry (De Luca et al., 2014), including practice-based research as a pedagogical approach to professional development/learning (Lammert, 2020; Goldsmith et al., 2014) are recommended to open up practice and engage in critical dialogue. These can drivers for change and agency. However, creating effective learning climates, supporting democratic social interactions and facilitation are key components to support effective communities of practice (Holland, 2018). The availability of technical and logistical support is critical to the success of PLCs (Richmond & Manokore, 2011) and all collaborative endeavours. Time, space, access to learning resources and dedicated staff with expertise contribute to the effectiveness of the PLCs.* [Report B5.1]

- *Develop a culture of mentorship at an institutional level to support the retention and development of teachers. Principals play a key role in establishing and resourcing mentoring structures, time for mentoring, resources for mentoring, places and spaces for mentoring (Kutsyuruba, 2020).* [Report B5.2]

- *Embed content-area instruction into PL (Scott et al., 2018) to support teacher preparedness for supporting early literacy development, as research suggests that beginning teachers have limited experience in applying instructional strategies for early literacy, including explicit, systematic pedagogical approaches that support children's early learning. PL for teachers of mathematics must include a disciplinary focus to enable teachers to integrate a rich understanding of the content and pedagogical approaches in mediating this content for learners (Stahnke et al., 2016). Professional development/learning in literacy and numeracy should incorporate an element of experiential learning that involves enacted pedagogy as 'teachers as writers' and 'teachers as mathematicians' (Ausiku & Matthee, 2021; Cremin & Oliver, 2017; Stahnke et al., 2016) There is a positive correlation between subject specific knowledge and student outcomes (Stahnke et al., 2016). PL should also support teachers to embed literacy instruction across disciplines (Scott, 2018). Support teachers to embed inquiry as a central pedagogy for literacy and/or mathematics development and enacting literacy/ mathematics across disciplines.* [Report B5.2]

- *Recognise that online/blended learning (OBL), which has been accelerated by COVID-19, has likely changed teacher PL forever (Bragg et al., 2021). Embrace the potential of online learning (Surrette & Johnson, 2015), communities of practice (Dille & Rokenes, 2021; Lantz-Andersson et al., 2018; Saifuddin & Majbrit, 2016), and use of social media and video analysis for teacher PL. Online learning ought to adhere to the core features of effective PL (Surrette & Johnson, 2015). Online collaboration can be successful where there is diversity within the group in terms of roles, areas and levels of expertise; where there is a moderator and where there are also opportunities to meet or socialise in person (Surrette & Johnson, 2015; Blitz, 2013). (Web-based virtual coaching is deemed cost effective, flexible and provides results comparable with in-person coaching (Powell, Diamond, Burchinal & Koehler, 2010) (Pillar 2: Teachers and ECEC PL; Pillar 3: School and ECEC leadership). (Giblin, McCormack, Ó Breacháin & Ryan, 2021; King, French & Halligan, 2021).* [Report B5.2]

- *Continue to invest in high-quality PL opportunities to support the design and approaches to PL in a bottom-up manner to meet contextual needs and allow for 'local, innovative and creative' approaches, potentially led by Education and Training Boards (Fitzpatrick, 2018, p. 10), Education Centres and/or schools and early childhood settings. No one form of PL is effective and approaches such as coaching, mentoring, collaborative learning, experiential learning should be implemented as part of a broader programme of support for teachers (Ansyari et al., 2020; Kraft et al., 2018; Surrette & Johnson, 2015). Provide*

structured planning and recording time for PL (DCEDIY, 2022), or release time and space for teachers to meet and to discuss their work and that of their students (De Luca et al., 2014; Ridge & Lavigne, 2020), along with time for planning and reflecting on change (Cordingley et al., 2015a). Structured time and space for collaborative learning has been shown to impact positively on students' test scores (Liou & Canrinus, 2020). Support further research to address the limited meta-analyses or systematic reviews related to literacy and numeracy. Currently there are no systematic reviews specific to Gaeilge or digital literacy. Further research is needed to account for specificity in terms of the content of specific PL interventions. (Pillar 4 Curriculum and the Learning Experience). (Giblin, McCormack, Ó Breachain & Ryan, 2022; King, French & Halligan, 2021). [Report B5.1]

Further Recommendations for PL arising from the Systematic Reviews B1—B6

Early Childhood Education and Care

- *Provide early childhood educators with evidenced-based PL programmes with multiple components of orientation to content area (language and emergent literacy), coaching, and feedback on practice through video analysis and communities of practice.* [Report B1.1]

- *Level five to eight ECEC programmes should include compulsory mathematics content. Mathematical content knowledge (MCK) including the big ideas of early mathematics and a broad range of mathematical topics and concepts; pedagogical content knowledge (PCK) and strategies for intentional teaching including math talk, use of picture books, enabling environments and multimodal approaches to mathematics; and finally the sequence in which children learn mathematical ideas including learning trajectories, mathematics documentation and assessment and planning appropriate pathways for future learning, should be included in all initial education.* [Report B2.1a]

- *ECEC educators require access to PL in math teaching and learning to enhance their MCK, PCK, and understanding of math learning trajectories. A similar approach to the LINC training, where a leader is appointed in mathematics to support practice, could ensure early numeracy expertise exists in all ECEC settings.* [Report B2.1a]

- *Educators in ECEC require an in-depth knowledge of foundational mathematics concepts, a knowledge of mathematical development and knowledge of teaching and learning of mathematics in ECEC contexts. Possession of such knowledge enables educators to notice, interpret and respond to or enhance children's mathematical activity (Gasteiger & Benz, 2018). [Report B2.1a]*

- *A broader range of mathematical topics and concepts should be included in ECEC curricular documents. The NLNS should be expanded to include children from birth to six years. Precursor concepts (Chen et al., 2017) should form the foundation of early numeracy approaches for babies and toddlers.* [Report B2.1a]

- *Professional development for educators in ECEC should include attention to the different ways in which children learn (Tickell 2011; Hussain, Woods & Williams 2019) and support them in developing the relevant expertise in language development and language assessment to allow them to make appropriate selections, observations, administrations, and interpretations of information provided by the tools and the methods they use (Conti-Ramsden & Durkin 2012). It should support educators who must be able to observe and record behaviours across multiple domains of development (Losardo & Notari Syverson, 2011) such as cognitive, affective and psychomotor (Drifte 2002).* [Report B3.1]

Literacy Primary

- *Teachers should be provided with extensive professional development to support them in developing the content and pedagogical content knowledge required for effective literacy instruction. It should include attention to research-based instructional strategies for key literacy skills (phonemic awareness, phonics, vocabulary, fluency, comprehension, writing, spelling, oral language).* [Report B4.3]

- *PD should support them in balancing attention to oral language, reading and writing in ways that are research-informed, matched to learners' stages of development and linked appropriately to curriculum (Dobinson & Dockrell, 2021; EEF, 2021; Murphy et al., 2009). In addition, it should include attention to the research on reading volume and reading for pleasure and consideration should be given to how to optimise volume of reading and engagement both in and out of school (Allington & McGill Franzen, 2021).* [Report B4.3]

- *Professional development in writing should ensure that teachers experience the writing strategies they will employ (Slavin et al., 2019; Graham, 2019); such experiences are critical to influencing teachers' beliefs about writing, their dispositions toward writing and writer identity which it is argued increases the likelihood that they will write, enjoy writing, and see the value of writing and teaching it (Graham, 2019).* [Report B1.2]

- *School leaders should be provided with extensive professional development in relation to research-informed balanced literacy instruction in order to support them in leading teachers in the development of an effective school-wide balanced literacy framework (Graham, 2019; Eurydice Report, 2011; Kennedy et al., 2012); see King et al., 2022; Giblin et al., 2022 for further literacy-specific recommendations.* [Report B1.2]

- *Professional development should support all relevant stakeholders in developing a positive identity as a writer and an understanding of how best to cultivate an engaged school-wide community of writers (Graham, 2019; Kennedy & Shiel, 2019).* [Report B1.2]

- *Embed language teacher competency in the Common European Framework of Reference for Languages (CEFR) to provide a standardised and transparent way of measuring teachers' language skills (Gallagher & Ní Mhaonaigh, 2009; Marsh et al., 2011; Ní Dhiorbháin & Ó Duibhir, 2021).* [Report B1.4]

- *Focus teacher professional development and teacher education on teachers' linguistic knowledge and pedagogical content knowledge, including transfer of skills across languages (Ní Dhiorbháin & Ó Duibhir, 2021; Ní Mhaonaigh, 2013, 2017; Ó Ceallaigh et al., 2017; Ó Ceallaigh et al., 2019). CLIL and Irish-medium teachers need support in integrating language with content through successful pedagogy (Tedick & Lyster, 2020; Ó Ceallaigh et al., 2017; Ó Ceallaigh et al., 2019).* [Report B1.4]

- *School leaders in Irish-medium settings should adopt a whole school approach to supporting students' social and academic use of Irish (Ó Ceallaigh & Ní Shéaghadha 2017), and forge links between schools, communities and homes (DES, 2016a).* [Report B1.4]

- *Assessment should form a key focus during preservice preparation and subsequent and ongoing in-service Professional Learning (Buldu, 2010*). [Report B3.1]

- *Teachers should be equipped with an understanding of the different approaches to formative assessment such as data-based decision-making drawing on the outcomes of tests, performance-based assessments, curriculum-embedded assessments, structured observations and minute-to-minute ongoing assessment in the classroom, and how these types of formative assessment can meet different educational goals (Schildkamp et al., 2020; Sparks, 2015; Wiliam, 2016). [Report B3.2]*

Literacy Post-Primary

- *Teachers should be provided with extensive professional development to support them in developing the content and pedagogical content knowledge required for effective literacy instruction. It should include attention to research-based instructional strategies for key literacy skills (vocabulary, fluency, comprehension, writing, spelling, oral language, metacognition and digital literacy skills) (Shiel et al., 2022).* [Report B1.3]

- *Time and space should be afforded to teachers to engage in professional conversations about how they understand literacy in their subject disciplines and across the curriculum (Hasni et al., 2016; Kalinowski et al., 2019; Scott et al., 2018) and to effectively embed literacy across subjects and disciplines (Shanahan, 2019).* [Report B1.3]

- *Bespoke professional learning opportunities should be provided to teachers based on the needs of their local school community (Dwyer, 2013, 2020; Leu et al., 2018; Tamborg et al., 2018).* [Report B1.3]

- *The development of pre-service teachers' literacy skills should be embedded in pre-service teacher education to enable them to make the connections between learning and practice, and to achieve a deeper knowledge of content instruction and pedagogy within school placement settings (Rose, 2011; Murnane et al., 2012).* [Report B1.3]

- *The nurturing of empathetic insight should be embedded into professional development to support teachers in fully integrating literacy across the curriculum (Rose, 2011, Murnane et al., 2012).* [Report B1.3]

- *Professional development/learning should give more attention to profiling student voice and teacher voice in order to capture their experiences of what is working and not working at the level of classroom practice (Skerritt et al., 2021).* [Report B1.3]

Digital Literacy

- *Professional development should recognise the complexities of incorporating digital literacies, multiliteracies and multimodalities into classrooms and ECEC settings so that educators can engage their students in meaningful literacy practices, incorporate effective pedagogies and design and create authentic collaborative learning spaces (Colwell & Hutchinson, 2015; Williams & Beam, 2019. (Teachers and ECEC CPD)* [Report B1.5]

Disciplinary Literacy

- *Professional development should recognise that supporting the integration of literacy with various disciplines is challenging at both primary and post-primary level; it is best achieved with supportive school structures, collaborative approaches among teachers that include observation of practice, the provision of appropriate supporting materials and resources for teachers, and time to plan amongst other factors (Hasni et al., 2016; Kalinowski et al., 2019; Scott et al., 2018).* [Report B1.5]

Numeracy Primary

- *PL needs first and foremost to address teachers' values, beliefs and attitudes with regards to how numeracy is conceptualised (Noss & Hoyle,1996; Schoenfeld, 1992, 2004), how its development can be measured and assessed (Fullan & Langworthy, 2014; See et al., 2021), as well as an understanding of what pedagogical approaches to use, including leveraging the use of digital tools (Harskamp, 2014; Slavin, 2013), in order to design rich learning environments and authentic experiences.* [Report B2.2]

- *Sustained professional learning opportunities, with a focus on the pedagogical strategies, approaches and methodologies in mathematics that support the development of numeracy, should be provided to post-primary mathematics teachers. (McDonald & Smith, 2020; Slavin, 2013).* [Report 3.2]

- *Educators need to develop an understanding of ways in which different approaches to integration meet different educational goals. An understanding of how "problem-solving" and "critical" numeracy can enhance or be enhanced through their own and other subject areas should be part of the discussion. (Askew, 2015; Belbase et al., 2021; Carter et al., 2015; Geiger, Forgasz, & Goos, 2015; Perignat & Katz-Buonincontro, 2019; White & Delaney, 2021).* [Report B2.3]

- *Educators should have the opportunity to develop relevant subject knowledge of the disciplines being integrated, including concepts, skills and processes (McKinney at al., 2014).* [Report B2.3]

- *Teacher professional learning also needs to target teachers' statistical literacy skills in order to better consider the predominant influence of artificial intelligence in our daily lives (Aziz & Rosli, 2021; Weiland, 2017).* [Report B2.2]

- *Professional learning opportunities relating to the embedding of Dynamic Geometric Software (DGS) into mathematics lessons is required to enable teachers to develop the necessary skills to use DGS effectively to develop children's mathematical thinking (Aliyu et al., 2021; Ayub et al., 2012; Beauchamp & Kennewell, 2013; Costică, 2015; Donnelly-Hermosillo et al., 2020) which in turn positively impacts student achievement (Chan & Leung, 2014; Juandi et al., 2021a; Moyer-Packenham & Westenskow, 2013), and can promote higher-order thinking skills such as critical thinking, deductive thinking, and visualisation skills (Aliyu et al., 2021; Browning et al., 2011).* [Report B2.2]

- *Teacher professional learning needs to be provided to enable teachers to choose appropriate materials, particularly the use of digital tools, to design learning that captures the interest of the students (Bray & Tagney, 2029; Talib et al, 2019; Sun et al., 2021b; Ugolini 2019) so that when teachers use mobile devices and technologies in mathematics education, they are able to employ them in the most appropriate way to develop students' higher-order cognitive and metacognitive competencies (Fidai et al., 2020; Popat & Starkey, 2019; Scherer et al., 2019; Sun et al., 2021b).* [Report B2.2]

Assessment

- *High levels of intensive and sustained professional development (PD) in formative assessment in literacy and numeracy should be available to primary and post-primary teachers. This PD should focus on teachers' pedagogical content knowledge, assessment literacy and data literacy, and should have onsite components (Lane et al., 2019; Lysaght & O'Leary, 2013, 2017; Schildkamp et al., 2020).* [Report B2]

- *Professional development for school leaders with responsibility for assessment in literacy and numeracy should include attention to the purposes and rationale of formative assessment, and the importance of provide a non-threatening environment where effective use of assessment data, in all its forms, can be modelled (Lane et al., 2019).* [Report B2]

- *Where the provision of professional development in formative assessment of literacy and numeracy is concerned, school leaders should ensure that teachers have regular and protected meeting time for meaningful examination of assessment practices and preparation of assessment tools, feedback and instructional response. Professional learning should be sustained, collaborative, work-embedded and situated within school needs. (Lane et al., 2019).* [Report B2]

- *Inservice teacher education and professional development for summative assessment should include attention to teacher assessment literacy that incorporates developing an understanding of principles of assessment, the application of this understanding to the development and evaluation of assessments that are suitable to different contexts, the preparation of students for assessment, and the interpretation of data produced by assessments (O'Leary et al., 2019).* [Report B3]

- *Decentralised organisational structures at school level, and distributed leadership are recommended for formative assessment in literacy and numeracy to ensure that accountability pressure on teachers does not lead to unintended impacts on teaching and assessment processes (Lane et al., 2019).* [Report B2]

Diverse Learners

- *Travellers and Roma. Initial teacher education and professional development should educate and inform teachers of the unique cultural values of Roma and Irish Travellers, and how best to support children from these groups in an inclusive classroom.* [Report B2]

- *Additional needs in literacy. Professional development is needed for teachers in literacy assessment to support DBI and how to intervene with explicit evidence-based teaching strategies (McMaster et al., 2021; Wanzek et al., 2016).*

- *Low-SES learners. Sustained high-quality professional development should be provided to schools located in low SES contexts to operationalise multi-tiered interconnected systems of support (Cheung et al., 2021; Dietrichson, 2017; Swanson et al., 2017). Teachers should become aware of the impact of their expectations on the performance of low-SES students, and communicate appropriately high expectations to all students (Wang et al., 2018). Teachers should note the importance of student self-concept, their self-efficacy and their self-expectations in mediating teacher expectations (Rubie, 2007).* [Report B4.3]

- *High-achievers. Schools and teachers should be supported in implementing a range of interventions both to extend the performance of highly able students in literacy and numeracy, and to increase the proportions of those with high achievement. Measures to raise the performance of high achievers should include enrichment activities within the context of current curricula, differentiation, programmes tailored to individual students' needs, acceleration and mentoring (Bailey et al., 2012; García-Martínez et al., 2021; Kim, 2016; Steenbergen-Hu & Moon, 2021).* [Report B4.10]

Family and Community Engagement

- *Principles to guide actions and decisions within community-based projects should include: strengths-based approaches, empowerment of communities, role modelling, communication, measurement and feedback (Blythe et al., 2013).* [Report B6.2]

- *The characteristics of effective programmes/partnerships should include: community engagement as a two-way process which involves knowledge of the community served (cultural competency), leadership, authentic community engagement in decision-making, curriculum implementation and a shared vision and goals (Trimmer et al., 2021).* [Report B6.2]

- *Effective mechanisms include Action Teams for Partnerships committees (Epstein, 2018), co-leadership frameworks (Trimmer et al., 2021) or collaborative family literacy partnerships (NALA, 2020). In this partnership approach early childhood settings, schools, community leaders, education systems, universities and policy-makers should work collaboratively to enhance children's outcomes (Trimmer et al., 2021).* [Report B6.2]

- *Professional development for setting leaders (early childhood, primary and post-primary) should emphasise ways to develop effective family engagement and develop policies to support effective family engagement. It should emphasise those aspects of collegial leadership which have been found to promote trust and a sense of community, i.e., establishing clear expectations, communicating concern for the welfare of early childhood educators and teachers, and focusing on education (and care) issues, and explore how this might be extended to family engagement practices (Smith et al., 2021).* [Report B6.2]

- *Community engagement should be firmly embedded in policy promoting successful LDLN learning and sufficient funding should be made available to support relevant initiatives.* [Report B6.2]

- *Support for persons involved in after-school programmes, book giveaway programmes, STEM initiatives, organisations involved in the promotion of literacy, libraries and museums should focus on developing leadership skills that promote engagement and cultivate partnerships between relevant agencies, institutions, settings and local communities. This would allow policy to be enacted at a local level in a way that directly impacts on children's outcomes. While community-engagement programmes should be responsive to local needs, they should also have clear goals, and be based on a well-researched theory of change or logic model which explicitly outlines the contribution from the relevant community members and expected outcomes (Gamse et al., 2017).* [Report B6.2]

- *Professional development and learning in leadership should include a focus on how school settings can promote engagement with all families in transition processes from home to early childhood settings; from there to primary school settings; from primary to post-primary and beyond to support children and young people's holistic learning as well as their sense of identity and belonging (Wildenger & McIntyre, 2011; Bierman et al., 2019; Powell et al., 2012) and academic success (Ashley et al., 2017; McCauley, 2010).* [Report B6.2]

- *Leadership professional development and learning should include a focus on how communities must be 'ready' to support children's and young people's transitions across a range of contexts, given that research on transitions tends to focus on children's readiness, rather than on 'ready' schools and families (Dockett & Perry, 2013).* [Report B6.2]

Supporting At-Risk Students

- *<u>Monitoring Effects.</u> While the performance of low-SES students has improved on some national assessments in literacy and numeracy in recent years, gaps between low-SES and high-SES students persist in Ireland and elsewhere (Weir et al., 2017; Bai et al., 2021). Hence, schools and teachers working with children with low-SES, whether in DEIS or non-DEIS schools, should be supported in monitoring the effects of interventions in literacy and numeracy more closely across a range of indicators for the appropriate target groups, to ensure that progress is accelerated and sustained.* [Report B4.3]

- *<u>Support for Formative Assessment.</u> In line with the importance attributed to differentiation in effective intervention programmes in literacy and numeracy (Puzio et al., 2020), teachers working with disadvantaged pupils should be supported in the effective use of formative assessment in intervention programmes. Attention should be given to frequency of assessment, interpretation of assessment data and how to use it to select appropriate instructional strategies.* [Report B4.3]

Pillar 4: Improving the Curriculum and the Learning Experience

Literacy: Early Childhood and Care Play

- *Provide play experiences to enable young children to "develop language skills, including vocabulary, decontextualized language, and oral narrative competence; provide opportunities for functional literacy behaviours; and support decoding-related skills" (Rand & Morrow, 2021, p.245).* [Report B1.1]
- *Socio-dramatic play, games and rich environments should be used to provide the context for carefully planned learning experiences and should be scaffolded by an adult who guides the play (Rand & Morrow, 2021).* [Report B1.1]

Shared Storybook Reading

- *Make shared storybook reading an integral pedagogy in the education of our youngest learners. The interactive and relational nature of sustained programmes of dialogic reading in particular, and the opportunities for rich conversation that they provide, should form the basis of early childhood pedagogy (Lake & Evangelou, 2019).* [Report B1.1]
- *The implicit teaching of vocabulary during shared storybook reading should be used to complement wider explicit teaching of language throughout the day (Lennox, 2013).* [Report B1.1]
- *Dialogic skills should be taught to educators, with a view to enhancing word learning (Walsh & Hodge, 2018).* [Report B1.1]
- *Children must encounter multiple exposures to target words alongside dialogic reading and all genres of books (Lennox, 2013).* [Report B1.1]

Children's Language and Emergent Literacy and Writing

- *Promote children's language and emergent literacy by exposing children to: varying and challenging word quantity (and quality), targeted words, lexical diversity, syntax and grammatical complexity, correct intonation and prosody and gestures, responsiveness, positive affect and sensitivity, cognitive stimulation interactions, linguistic encouragement, quality book reading, singing, storytelling and rhymes (Zauche, et al., 2016).* [Report B1.1]
- *Early childhood educators working with babies must understand early phonetic development in babbling due to its contribution to speech and language development and in order to access early intervention (Morgan & Wren, 2018).* [Report B1.1]

- *Further research on teacher-child interactions, using an eco-behavioural model, which involves adults' knowledge, beliefs, and behaviour, environmental considerations, and policies and practices are required to maximise language development for all children (Ford et al., 2018).* [Report B1.1]

- *Design play spaces containing literacy objects, with facilitators engaged in writing experiences through modelling and guidance, journaling, bookmaking, interactive writing, shared writing (Hall et al., 2015, p.23) and invented spelling (Ouellette & Sénéchal, 2017; Albuquerque & Alves Martins, 2019).* [Report B4.1]

Literacy: Primary

Research-Informed Balanced Literacy Instruction

- *Teachers should adopt a comprehensive, integrated approach to literacy instruction that is balanced in nature. As there are varying interpretations of the term balanced literacy, 'balanced' is interpreted to mean: balanced in terms of attention to systematic, evidence-based explicit and intentional teaching of constrained skills (e.g., phonics, letter knowledge) and unconstrained skills (e.g., vocabulary, comprehension, composition) in line with the key tenets of the science of reading, tailored to children's assessed needs and stages of development; balanced in providing access to a wide variety of genres and 'texts' in reading and writing; balanced in terms of formative and summative assessment practices and balanced in terms of attention to oral language, reading and writing, recognising the reciprocal relationship and mutually supportive processes between them (Bradbury & Wyse, 2022; Graham et al., 2018a; Reynolds et al, 2011; Kennedy et al., 2012; Eurydice Report, 2011).This means that a teacher must attend to both the explicit and systematic teaching of code-based skills (e.g., phonics), with the provision of meaningful opportunities to apply these skills when reading connected texts (connected texts are meaningful texts with multiple related sentences characterised by a coherent and cohesive structure) and when creating texts in a variety of modes, genres and disciplines.* [Report B1.2]

- *Teachers should integrate oral language, reading and writing within literacy instruction, rather than teaching them in isolation from each other given the reciprocal relationship between the forms of language (Graham et al., 2018a, 2018b; Graham, 2020; Eurydice Report, 2011; Kennedy et al., 2012; Dockrell & Dobinson, 2021).* [Report B1.2]

- *Teachers should provide opportunities for independent reading and writing in addition to explicit literacy instruction (Jouhar & Rupley, 2021).* [Report B1.2]

- *The time allocation for literacy should be given careful consideration in future policy and curriculum developments to ensure sufficient time is allocated for children to develop key literacy skills within a balanced, systematic and integrated approach to literacy (Graham et al., 2012a; Shanahan, 2010; Kennedy et al., 2012; Graham, 2019, 2020).* [Report B1.2]

Oral Language Development

- *Teachers should integrate oral language into meaningful contexts such as interactive book reading, literature discussions, content areas across the curriculum, writing process and writing genres approaches (Dobinson & Dockrell, 2021; Graham et al., 2018a, 2018b; Dwyer et al., 2022). To impact on expressive language skills, teaching must be purposeful and intentional (APPG, 2021; EEF, 2021).* [Report B1.2]

- *Teachers should adopt a dialogic approach to literature study and emphasise higher-order comprehension skills and critical appraisal of texts. (EEF, 2021; Murphy et al., 2009).* [Report B1.2]

Reading Dispositions, Agency, Motivation and Engagement

- *Teachers should examine ways in which school contexts provide spaces for the development of agency and (in turn) engagement and motivation. Instructional practices that allow students to construct identities as readers, develop positive dispositions towards reading, involve and encourage dialogue, critical engagement and privilege student choice in terms of materials and resources should be considered (Vaughn et al., 2020).* [Report B1.2]

- *To address gender differences in motivation to read between males and females, educators should adopt measures to improve the value placed on reading by male students. Teachers should provide consistent informative feedback on effective reading strategies; set challenging but achievable tasks; promote active learning goals, such as monitoring understanding through self-questioning; and create regular opportunities for students to promote what they are reading through book talks (Wigfield et al., 2016).* [Report B1.2]

Phonological Awareness

- *Phonological and phonemic awareness must be explicitly and systematically taught in the early years of school (Eurydice Report, 2011; Invernizzi & Tortorelli, 2013; Reynolds et al., 2011; Kennedy et al., 2012). Teachers should read storybooks aloud regularly to enhance phonological awareness (Nevo et al., 2018; Swanson et al, 2011). Children should be encouraged to act out, share and tell their own stories as a means of enhancing phonological awareness (Nicolopoulou et al., 2015). Teachers should explicitly teach students to segment syllables, onset-rimes, and phonemes in spoken words. Twenty hours of phonemic awareness instruction is optimal; instruction should be combined with letter manipulation, taught in small groups, in sessions of approximately 30 minutes duration (Foorman et al, 2016; Invernizzi & Tortorelli, 2013; Reynolds et al., 2011). Further instruction should be directly linked to the teaching of phonics and spelling (Invernizzi & Tortorelli, 2013).* [Report B1.2]

Phonics, Spelling and Morphology

- *Phonics should be part of a total reading programme, and balanced with instruction that focuses on aspects of reading for meaning (Bowers, 2020; Eurydice, 2011; Reynolds, Wheldall & Madelaine, 2011).* [Report B1.2]

- *Teachers should adopt a systematic approach to phonics instruction for younger readers (Ehri, 2020; Eurydice, 2011; Reynolds, Wheldall & Madelaine, 2011; Torgerson et al., 2019) that emphasises sound-spelling patterns, morphological elements of words and the interrelation between phonology, morphology, and etymology. Struggling readers should experience small group phonics instruction (Eurydice, 2011; see also Kennedy & Shiel, 2022; Reynor, 2022).* [Report B1.2]

- *Children should experience formal systematic and explicit spelling instruction, given that spelling is an integral part of the orthographic knowledge that underlies efficient, automatic generation of words during writing, and efficient, automatic perception of words during reading; spelling instruction influences reading achievement and frees up the cognitive resources required for higher-order processes of writing (Kennedy et al., 2012; Graham & Santangelo, 2014; McMaster 2018; Kent & Wanzek, 2016).* [Report B1.2]

- *Teachers should consider the important role played by invented spelling in learning to decode and encode (Ouellette & Sénéchal, 2017; Kennedy et al., 2012). Children in the early years of primary school should have opportunities to utilise invented spelling as they compose; invented spelling supports phonological and phonemic awareness and has been shown to provide a causal pathway to proficient reading (Ouellette & Sénéchal, 2017.* [Report B1.2]

- *Teachers should teach morphology as part of their reading instruction (e.g., identifying, segmenting, and building with morphemes; teaching morphological patterns that support spelling; exploring affix and root meanings and examining compound words) (Goodwin & Ahn, 2013; Sedgwick & Stothard, 2018).* [Report B1.2]

Vocabulary Development

- *There should be a sustained emphasis on the development of vocabulary (Cregan, 2019). Vocabulary should be taught both incidentally and directly using multiple methods (Hattie, 2009; Reynolds, Wheldall & Madelaine, 2011) across different contexts (Coyne et al., 2009; Grover, 2017; Nielsen & Friersen, 2012).* [Report B1.2]

- *Interactive book reading that involves discussion, extended vocabulary activities and multiple readings of the text should be used to develop children's vocabulary (Swanson et al, 2011; Wasik, Hindman & Snell, 2016). Teachers should use a combination of embedded instruction, where vocabulary is taught in context of a text using child friendly definitions, and extended vocabulary instruction that incorporates phonics, morphological awareness and phonological and orthographic tasks in follow-up activities should occur (Sedgwick & Stothard, 2018). Teachers should use challenging, inferential and extra-textual talk during shared reading lessons with young children to enhance vocabulary development (Dickinson & Porche, 2011; Zucker et al., 2013).* [Report B1.2]

- *Graphic organisers should be used when appropriate to support vocabulary learning (Hairrell et al., 2011).* [Report B1.2]

- *Vocabulary instruction should include a focus on academic language skills (Foorman et al., 2016). Teachers should use multimodal approaches to vocabulary learning (gestures, images and sounds) (Lawson-Adams & Dickinson, 2020; Rowe et al., 2013; Tellier, 2008), particularly when the focus is on academic vocabulary (Townsend et al., 2012).* [Report B1.2]

Fluency Development

- *Oral reading fluency should be developed through the repeated reading of texts that are guided by the teacher (Hudson et al., 2020; Rasinski et al., 2009; Reynolds et al., 2011). Approaches should be used that incorporate repeated readings include paired reading, assisted reading, phrase reading, radio reading, 'the oral recitation lesson' (ORL), 'fluency development lessons' (FDLs), 'fluency orientated reading instruction' (FORI), and Fast Start (Eurydice, 2011; Kennedy et al. 2012; Nichols et al., 2009; Rasinski, et al., 2009). Teachers should also use echo reading, choral reading, partner reading and reading with a computerised device to enhance oral reading fluency (Foorman et al., 2016). Teachers should consider the role played by oral reading fluency in developing comprehension (Hudson et al., 2020).* [Report B1.2]

Comprehension Development

- *Teachers should teach students a range of comprehension strategies that will help students construct meaning from narrative, informational, expository multimodal and digitals text while concurrently teaching them to become independent self-regulated readers (Davis, 2013; IES, 2010; Shanahan et al., 2010). Teachers should choose texts that support their teaching goals and improve reading comprehension.* [Report B1.2]

- *Teachers should consider integrating literacy with content area (across the curriculum) instruction to enhance vocabulary, comprehension, writing, oral language and content knowledge (Hwang et al., 2021). This recommendation should be considered in light of the ongoing review of the curriculum at primary and post-primary levels.* [Report B1.2]

Writing Motivation, Engagement and Agency

- *All children in primary school (JI to 6th) should have daily opportunities to engage in compositional writing in a range of genres (print, multimodal and digital) for real purposes and audiences in authentic contexts (Graham et al., 2012a, 2012b; Graham 2019). This time should be split between explicit instruction and time for children to actively compose (Graham et al., 2012a; Limpo & Graham 2020; Graham 2019).* [Report B1.2]

- *To enhance student agency, engagement and writer identity, students should have ownership over their writing through choice of topic and determination of time spent on a particular topic; (Vaughn 2020; Camacho et al., 2021; Limpo & Graham, 2020).* [Report B1.2]

- *Teachers should ensure conditions in classrooms support students' motivation, engagement and self-efficacy in writing (Camacho et al. 2021; Vaughn 2020). This should be accomplished through social persuasion, and vicarious and mastery experiences that build students' confidence and success with writing (Limpo et al., 2020; Kennedy & Shiel 2019).* [Report B1.2]

Writing Processes and Writing Genres

- *Teachers should adopt a process-based approach to writing and combine it with explicit teaching of strategies for planning, drafting, revising, editing and publishing writing on a regular basis. When teaching these strategies, teachers should combine self-regulated strategy instruction pedagogies (SRSD) and goal setting and also link strategies to the genre form (McMaster et al. 2018; Koster et al. 2015; Graham et al. 2012a, 2012b; Graham 2019).* [Report B1.2]

- *Students should be explicitly taught text structures for each genre of writing; Links should be made with reading text structures (Graham et al., 2012b; Koster et al., 2015).* [Report B1.2]

- *Teachers should scaffold and support children when engaged in the act of writing (Graham et al., 2012b); Children should be provided with opportunities to collaborate and support each other in writing (Slavin et al., 2019).* [Report B1.2]

- *Students should be explicitly taught how to assess their own and others' writing drafts, to give and receive feedback using insights gained from effective writing strategies taught. These need to be modelled by the teacher (Slavin et al., 2019; Graham et al., 2012a; Kennedy & Shiel, 2019). Teachers should also give timely focused and specific feedback to students on their writing quality (Koster et al., 2015; Graham et al., 2011; Graham 2012a; Graham, Hebert & Harris, 2015).* [Report B1.2]

- *Instruction should be balanced between the higher-order dimensions of writing and the mechanics of writing (grammar, spelling and punctuation) (Graham et al., 2012a; Kennedy et al., 2012; Kennedy & Shiel, 2019).* [Report B1.2]

Grammar and Writing Instruction

- *Grammar should be taught in the context of authentic writing where it can be utilised as a design tool for communicating. Grammar should not be taught through isolated decontextualised activities. Instead, to improve writing quality, teachers should focus on the lexical, syntactical and rhetorical features of language, within the context of authentic writing within genres and across the disciplines. Children should be taught to compose syntactically more complex sentences as they develop their writing skills (Myhill & Watson 2014; Koster et al., 2015; Jagaiah et al. 2020). EAL pupils will also benefit from some explicit contextual teaching, though much of their emerging syntactic knowledge will grow from implicit teaching within the context of tasks and teacher feedback (August, McCardle & Shanahan, 2014; Baker et al., 2014; Kang, Sok & Han, 2019).* [Report B1.2]

Handwriting and Touch-Typing

- *Teachers should ensure explicit systematic instruction in handwriting to benefit legibility and writing fluency, to improve writing quality (McMaster et al., 2018; Fancher et al., 2018) and influence writer self-efficacy (Santangelo & Graham, 2016; Feng et al., 2019). Biweekly to daily lessons lasting 10 to 30 minutes are recommended (Limpo & Graham, 2020).* [Report B1.2]

- *In Infants to 3rd class, handwriting practice should be distributed over time (e.g., 10 minutes-20 minutes daily) and older children (4th class up to 3rd Year) should receive between 5-10 hours of age-appropriate instruction (Santangelo & Graham, 2016; Limpo & Graham 2020).* [Report B1.2]

- *In teaching beginning handwriting (print or cursive), children should be taught to simultaneously recognise and name a letter, sound it and write it (Fancher et al., 2018; Schwellnus et al., 2012).* [Report B1.2]

- *Teachers should assess handwriting for legibility, speed, fluency and accuracy (Limpo & Graham, 2020).* [Report B1.2]

- *Students should be taught to touch type as a valuable life skill but technology should not replace handwriting instruction which is foundational to writing (Graham et al., 2012a; Feng et al., 2019); students should be taught digital, multimodal and word processing skills (Patino et al., 2020).* [Report B1.2]

Literacy at Post-Primary Level

- *Teachers should provide opportunities for post-primary students to present and evaluate information that is derived from "texts" in the broadest sense and in a manner that combines reading and writing, speaking and listening (Graham et al, 2018; Rose, 2011). Students should be taught a range of comprehension strategies and processes for digital and print texts including: integrating information, generating inferences, corroborating and handling conflict, and assessing the quality and credibility of texts (Brun-Mercer, 2019; Dobler & Eagleton, 2015; Harris, 2015).* [Report B1.3]

- *Teachers should place a stronger focus on developing students' comprehension of multiple-source texts in teaching, learning and assessment (Goldman et al., 2012, 2016).* [Report B1.3]

- *Teachers, parents and students should work collaboratively to promote more frequent engagement in reading a range of text types for enjoyment (OECD, 2019; Shiel et al., 2022) and develop students' agency and identity as readers (Barber & Klauda, 2020).* [Report B1.3]

- *The development of teaching and learning approaches for effective reading strategies is recommended, drawing on the learning outcomes in the Junior Cycle English specification as a basis, building in cross-curricular strategies, and tailoring instruction to various ability levels (Shiel et al., 2022).* [Report B1.3]

- *Schools and teachers should support students in developing coherent linkages between and among digital and non-digital texts across subjects (Shiel et al., 2022).* [Report B1.3]

- *Students should be supported in developing their writing skills through instruction in implementing pre-writing activities, using a process writing approach (planning, writing and editing texts), studying models of writing, combining sentences, word processing, writing collaboratively and summarising (Graham & Perin, 2007; Kennedy & Shiel, 2019). Attention should also be given applying these skills in the disciplines as well as in language classes.* [Report B1.2]

Literacy: Gaeilge

- *Task-based language teaching (Bryfonski & McKay, 2019; Flynn, 2021; Tavakoli & Jones, 2018) and CLIL should be incorporated into the teaching of Irish and communicative language teaching should be balanced with analytical approaches to teaching (Fitzpatrick et al., 2017; Harris & Ó Duibhir, 2011).* [Report B1.4]

- *The number of students in Irish-medium immersion programmes should be increased to produce greater numbers of biliterate bilingual speakers (Fitzpatrick et al., 2018; Harris & Ó Duibhir, 2011).* [Report B1.4]

- *Students must be provided with opportunities to engage in meaningful oral language, reading and writing in a variety of genres in Irish, making explicit links between the reading and the writing process (DES, 2016b; Fitzpatrick et al., 2018; Hickey & Stenson, 2017; Al-hajji & Shuqair, 2014; Ní Mhaonaigh, 2013, 2017).* [Report B1.4]

- *Students should be exposed to a wide range of books and texts including digital books to support bi-pluriliteracy (Ducuara & Rozo, 2018). Research has revealed that information/expository texts are especially beneficial for vocabulary development in the L2 (Sorrell & Brown, 2018). Glossed reading with careful use of L1 (Yanagisawa et al., 2020; Ramezanali et al., 2021) may support reading in Irish.* [Report B1.4]

- *Strategy training (e.g., planning, cognitive and metacognitive strategies), and creating a suitable environment can improve L2 writing performance (Raoofi et al., 2014).* [Report B1.4]

- *Students must be engaged in the writing process and have opportunities to write collaboratively in Irish which allows for negotiation of both meaning and form, and opportunities to discuss language (Elabdali, 2021; Lu & Kim, 2021). Texts for group and individual reading have benefits for extensive reading for L2 readers when texts are at a suitable level (Al-hajji & Shuqair, 2014; Cole, 2014).* [Report B1.4]

- *Students should learn spelling rules in Irish and compare word patterns in Irish with English and other languages (DES, 2016b; Stenson & Hickey, 2019). Irish is a morphologically rich language and more emphasis on the morphology of Irish in teaching and learning could prove beneficial (Barnes, 2017).* [Report B1.4]

- *L2 grammar must be explicitly taught in context if there is limited use of the target language outside of school, as is often the case with Irish. Deductive and inductive approaches to teaching grammar (Fitzpatrick et al., 2018; Goo et al., 2015; Kang et al., 2018) are effective.* [Report B1.4]

- *Flipped learning (Bond, 2020; Vitta & Al-Hoorie, 2020) should be used to enhance students' learning of Irish (Bond, 2020; Vitta & Al-Hoorie, 2020). Teachers should promote self-directed and autonomous learning in Irish (Nic Eoin, 2017; Ó Laoire, 2017).* [Report B1.4]

- *Computer assisted language learning (CALL) (Bibauw et al., 2019; Plonsky & Ziegler, 2016), Mobile assisted language learning (MALL) (Burston, 2015; Cheng et al., 2020; Fu, 2018; Lin & Lin, 2019; Peng et al., 2020; Persson, 2018; Sung et al., 2015), digital game-based language learning (DGBLL) (Acquah et al., 2020; Dehghanzadeh et al., 2019; Hao, 2021; Tsai & Tsai, 2018) should be employed as tools to improve the L2 learning experience and outcomes. Digital resources with clear language learning goals should be developed and carefully implemented in the context of Irish.* [Report B1.4]

- *Big books should be used as a resource for shared reading and should focus on the specific language needs of L2 learners (Mhic Mhathúna, 2010; Wang, 2011).* [Report B1.4]

Digital Literacy

- *Teachers need to create collaborative, authentic, learning environments, and engage and scaffold students through explicit strategy instruction and modelling, so that students develop the skills, strategies, social practices, and dispositions they require to learn in digital environments. Digital literacy should begin in Early Childhood Care and Education and continue into primary and post–primary settings (Dwyer, 2013; 2020; Leu et al., 2018; Tamborg et al., 2018).* [Report B1.5]

- *Teachers must consider curriculum goals and learning outcomes for students before considering the meaningful use of technology to enhance literacy and learning in the classroom (Martínez-Bravo et al., 2020; Mishra & Koehler, 2006. Røkenes & Krumsvik, 2014; Rybakova et al., 2019).* [Report B1.5]

- *Practice should be underpinned and grounded in research. A robust research-to-practice focus should be firmly grounded in classrooms and other learning spaces. (Bradley & Reinking, 2011; Yang et al., 2018).* [Report B1.5]

- *Issues of equality of opportunity, excellence in instruction, social inclusion, and social justice should underpin all that we do to ensure that all students, regardless of ethnicity, age, geographical location, class, gender or socio-economic status (SES), have equitable and quality access to digital technologies for literacy and learning in classrooms, homes, and communities (Martínez-Bravo et al., 2020; Rybakova et al., 2019; Scheerder et al., 2017).* [Report B1.5]

- *Teachers need to consider their role in advocating for the appropriate use of technology with young children, and the optimal use of digital technology in classroom and ECEC settings (Joint Research Centre (European Commission) et al., 2018; Mantilla & Edwards, 2019; Marsh, 2019; Marsh et al., 2016*). [Report B1.5]

- *Incorporating digital literacies, multiliteracies and multimodalities into the classroom and ECEC setting is complex work. Teachers need professional development in order to engage their students in meaningful literacy practices, incorporate effective pedagogies and design and create authentic collaborative learning spaces (Colwell & Hutchinson, 2015; Williams & Beam, 2019).* [Report B1.5]

Disciplinary Literacy

- *Literacy should not be separated from content area instruction (Guo et al. 2016; Hwang et al. 2021). A shift towards the full integration of both in school curricula is warranted.* [Report B1.6]

- *Teachers should support students to gain insights into how questions are asked and answered within each discipline, how conclusions are drawn, supported, contested and defended. Instruction should be tailored to the specific features and demands of each discipline (Goldman et al., 2016; Shanahan & Shanahan, 2017; Wright et al., 2016).* [Report B1.6]

- *Students taught using project-based methods exhibit greater gains in content knowledge, have higher levels of engagement, and have more positive perceptions of subject content than their traditionally taught peers (Baleman & Keskin, 2018; Holm, 2011). Inquiry-based or project-based methodologies that link content-area learning with literacy should be considered in both primary and post-primary curricula. It is important to draw on the characteristics of successful approaches (e.g., the need for teacher instruction on how to successfully research and analyse sources for a project).* [Report B1.6]

- *Meaningfully integrating writing with learning in a given discipline has a substantial impact on both writing skills and conceptual learning (Graham et al., 2020). Curriculum reform at both primary and post-primary level should outline clear expectations for how writing (in various forms and modes) is used to support and advance subject-based learning.* [Report B1.6]

- *Writing should be taught in a manner that supports the characteristic ways of thinking and teaching associated with different subjects, with increasing specialisation as learners progress into post-primary school (Graham et al., 2020; Miller et al., 2018; Shanahan & Shanahan, 2008).* [Report B1.6]

- *Intrinsic links should be forged between the critical reading and analysis of multiple sources and the writing of synthesis texts based on these sources, in line with subject-specific expectations (Van Ockenburg et al., 2019).* [Report B1.6]

- *The integration of writing with disciplinary learning demands that teachers are familiar with key writing approaches and pedagogies (e.g., the teaching of planning as part of the writing process; how to use sources); this extends to teachers of content-areas at post-primary level (Graham et al., 2020; Van Ockenburg et al., 2019).* [Report B1.6]

Numeracy

Learner Dispositions

- *In order to develop positive attitudes and motivation to learn, mathematics needs to be presented as a sense-making activity (DES, 2011; ETI & DES, 2015; NCCA, 2017) to which learners can bring creative approaches, engage in both problem solving and problem posing (Hoth et al., 2017; Bicer et al., 2021), and explore multiple solutions and solution pathways to build conceptual understanding (Boaler, 2015; ETI & DES, 2015; Cirillio et al., 2016; Cason et al., 2019), have agency and ownership in producing their own mathematical content and engage in mathematical writing (Firmender et al., 2017; Trakulphadetkrai et al., 2019; Graham et al., 2020; NCCA, 2020).* [Report B2.1b]

- *Learners need to be active in their learning rather than passive recipients of knowledge (NCCA, 2017 & 2020), in ways such as problem solving and mathematical talk and discussion (Merritt et al., 2017), using resources and representations, both concrete and digital, as well as children's literature, as an integral part of their mathematical experiences (Carbonneau et al., 2013; Cirillio et al., 2016; Ginsburg, 2016; Kul et al., 2018; Edelman et al., 2019), being physically activity and combining play-based approaches with playful teaching and learning (Dooley et al., 2014; EEF, 2018; Vetter et al., 2019).* [Report B2.1b]

- *Learners should be given the opportunity to generate their own representations of mathematics and engage with exploratory digital environments (Bryun & Joung, 2018; Sokolowski, 2018), to construct meaning through robotics-learning experiences (Anwar et al., 2019; Çetcin & Demircan, 2020; Zhong & Xia, 2020), to use digital game-based learning to increase student motivation and to enhance student interest/attitude in mathematics (Chen et al., 2020; Svela et al., 2019).* [Report B2.1b]

- *Planning for integrated learning should include a focus on learning outcomes of all subjects involved, including numeracy goals. Outcomes that extend beyond the cognitive domain to include affective and interpersonal components should be considered. Learning activities should be carefully planned with regard to their potential to promote learning in all subjects involved (Ahlskog-Björkman & Björklund, 2016; Belbase et al., 2021; Gao et al., 2020; White & Delaney, 2021).* [Report B2.3]

Contexts for Learning

- *Teachers should spend time developing a classroom culture in mathematics that supports effective peer-to-peer collaboration; encouraging student explanations and questions, and teaching students how to listen and respond to each other's ideas while holding individuals accountable for their own learning (Anthony & Walshaw, 2007; Baker et al., 2015; Hodgen et al., 2018).* [Report B2.1c]

- *Learners should work in heterogeneous collaborative groups to problem solve (Drunk et al., 2018; Merritt et al., 2017).[Report B2.1b]*

- *Classroom spaces and timetabling that are conducive to an integrated approach should be provided (Belbase et al., 2021).* [Report B2.3]

- *Put the needs of all learners to the fore and provide all children with the opportunity to engage with high-quality mathematics and develop their own mathematical ideas (Merritt et al., 2017; Cason et al., 2019; Trakulphadetkrai et al., 2019; NCCA, 2020).* [Report B2.1b]

Fostering Mathematical Knowledge

- *Approaches to early numeracy must be compatible with ECEC pedagogy where holistic learning, child-led approaches and play are central (Björklund et al., 2018; Dooley et al., 2014, Wood, 2019). Play situations should be used to enable children to explore mathematics concepts (MacDonald & Murphy, 2019; McCray et al., 2014). Both free play and playful learning guided by adults is required (Clements & Sarama, 2021; Fleer, 2014). Intentional teaching should be utilised to provide children with varied early numeracy experiences (Chesworth & Wood, 2017; Helenius, 2018; Knaus, 2017; Thiel & Jenssen, 2018; Thiel & Perry, 2018).* [Report B2.1a]

- *A focus on metacognition and self-regulated learning should be built into students' engagement with mathematical tasks or problems. In particular, students should be given opportunities to elaborate on their thinking in their learning of mathematics (Donker et al., 2014; Hodgen et al., 2018; Shin and Bryant, 2015).* [Report B2.1c]

- *Through discussion, teachers should elicit, listen to and respond to the substance of students' mathematical thinking, providing feedback as appropriate and adjusting teaching based on observations of their thinking (Anthony & Walshaw, 2007; Apthorp et al., 2012; Dietrichson et al., 2017; Dietrichson et al., 2020; Hodgen et al., 2018).* [Report B2.1c]

- *The use of problem-/project-based learning and problem posing perspectives as a methodology within mathematics and in the integration of all subjects with numeracy is recommended. Educators should identify, explore and interrogate mathematics problems that are meaningful and relevant to learners' lives and that offer scope for problem-based learning and problem-posing experiences including those that arise in other subject areas (Bennison, 2015; McDonald & Smith, 2020; Merritt et al., 2017). A range of problems, varying from unstructured to structured, should be embedded in classroom practice, and should infuse all strands of the post-primary mathematics curriculum (Cason et al., 2019; Hodgen et al., 2018; McDonald & Smith, 2020; Merritt et al., 2017).* [Report B2.3]

- *Curriculum documentation should draw attention to and provide examples of effective integration of numeracy across the curriculum, such as CLIL (including immersion approaches), STEM/STEAM and its many modifications, and subject- and content-based integration (Carter et al., 2015; McKinney et al., 2014).*[58] [Report B2.3]

[58]Whereas this recommendation arose from systematics reviews with direct reference to post-primary, it can be inferred that it is applicable to primary as well.

Tools to Support Learning

- *A wide range of appropriate tools – digital and non-digital – should be carefully selected and made available to learners to develop and extend their mathematical understanding. Their use should be supported by appropriate instruction, and should allow students to explore mathematics, and facilitate them to see mathematical structures. When possible, non-digital and digital tools should be used in conjunction with each other (Moyer-Packenham & Westenskow, 2013). Dynamic Geometric Software should be used to provide students with opportunities to gain access to mathematical representations and visualisations that would not be possible to explore on paper or using concrete manipulatives (Aliyu et al., 2021; Ayub et al., 2012; Beauchamp & Kennewell, 2013; Costică, 2015).* [Report B2.1c]

- *Technology-assisted systems for mathematics instruction must be developed in line with mathematics learning trajectories to ensure that learning tasks/assessment utilised by these systems are informed by research grounded in mathematical learning. Consideration should be given to the 'cognitive load' placed on students interacting with digital technologies as to how it may support/interfere with the learning task at hand or lead to distractions as success is dependent on students' own digital literacy and competencies (Verbruggen et al., 2020).* [Report B2.2]

Assessment for Literacy/Digital Literacy and Numeracy: Implications for Curriculum

- *Teachers should be supported to use learning trajectories in literacy and numeracy as part of their formative assessment practices (Calkins et al., 2019; Hodgen et al., 2020).* [Report B3.2]

- *Teachers should collaborate to design tasks that are suitable for revealing students' thinking, sense-making and misconceptions in literacy and numeracy (Burkhardt & Schoenfeld, 2019; McDonald & Smith, 2020; Traga-Philippakos & Moore, 2020).* [Report B3.2]

- *Formative assessment should be an integrated element of literacy and numeracy instruction, with teachers and students jointly responsible for the quality of teaching and learning in classrooms. There should be an emphasis on interaction between teachers, students and their peers in order to facilitate formative assessment (Heitink et al., 2016; Schildkamp et al., 2020).* [Report B3.2]

- *Tasks that reveal students' thinking in literacy and numeracy should be incorporated into the learning experience, e.g., writing for learning; portfolios (including e-portfolios); running records of reading; documentation of talk; mathematical problem-solving and problem posing; mathematical concept maps; and diagrams (Burkhardt and Schoenfeld, 2019; Graham et al., 2020; Hartmeyer et al., 2017; Hodgen et al., 2020; McDonald & Smith, 2020; Traga-Philippakos and Moore, 2020; Wang et al., 2020).* [Report B3.2]

- *Students should be explicitly taught how to assess their own and others' writing drafts, to give and receive feedback using insights gained from effective writing strategies taught. These need to be modelled by the teacher (Slavin et al., 2019; Graham et al., 2012a; Kennedy & Shiel, 2019).* [Report B1.2]

Pillar 5: Helping Students with Additional Learning Needs to Achieve their Potential

Gaeilge

- *Students with additional needs should not be excluded from learning Irish (Genesee, 2022; Sparks, 2016; von Hagen et al., 2021). Teaching, learning and assessment should be differentiated to support all students in learning Irish (Nic Aindriú, 2021).* [Paper B1.4]

Early Childhood Education and Care Settings

- *Improving access to high quality early care and education must be made available for culturally and linguistically diverse children attending ECEC programmes (Larson et al., 2020). Such ECEC must provide cultural or linguistic adaptations to significantly affect language outcomes in the home language or English/Irish.* [Paper B4.1]

- *The role of learning through play must be elevated to counteract inequality in children's outcomes and opportunities and should be an integral part of any government policy aimed at giving children greater skills and knowledge in their early years (Dowd & Thomsen 2021).* [Paper B4.1]

- *To narrow the achievement gap, create interventions powerful enough to accelerate children's vocabulary development (Marulis & Neumann, 2013) educators should provide: explicit information about words being taught and give children opportunities to engage in word learning in the context of storybooks; theme based strategies for vocabulary instruction; a variety of vocabulary teaching methods; multiple instances of exposure and instruction for each word; pedagogical methods that allow children to acquire a depth of word knowledge that meets their need for understanding meaning; labelling; read-aloud-based interventions; and play with target words (Christ &Wang, 2011), child-initiated activities, activity stations, art, music and play in small groups or whole class with dedicated time (Chambers et al., 2016).* [Paper B4.1]

- *Literacy interventions for young children with additional needs should include: Shared reading as a positive strategy for teaching emergent literacy skills (Leech, McNally, Daly & Corriveau, In Press; McNally, McCrory, Quigley & Murray, 2019); e-books as part of shared reading (Green et al., 2018; Segal-Driori et al., 2019); and phonological awareness as a target skill (Wanzek et al. (2018).* [Paper B4.2a]

- *Numeracy interventions for young children with additional needs should include:*

    - *An increase in time and support for prevention and early intervention for mathematics difficulties (Nelson & Powell, 2018).* [Paper B4.7]

    - *One-to-one teaching of a longer rather than shorter duration for children learning English as an additional language rather than computer-based interventions (Arizmendi et al., 2021).* [Paper B2.1a]

    - *The use of two or more instructional strategies (Charitaki et al., 2021), an emphasis on counting with one-to-one correspondence (Nelson and McMaster, 2019) and the targeting of a single content strand (Wang et al., 2016).* [Paper B2.1a]

    - *Shared reading with a focus on teaching key numeracy skills (Rogde et al., 2019) and the use of e-books to engage children with developmental delays who are at-risk of Learning Disability (Green et al., 2018; Segal-Driori et al., 2019).* [Paper B4.2b]

Addressing Achievement Gaps in Literacy and Numeracy Arising from Educational Disadvantage in Primary and Post-Primary Settings

- *Every effort should be made to ensure that children with additional learning needs are strongly supported to develop key language, literacy and mathematical skills by age 8 given that these years of schooling are a critical period for skills development in literacy (Allington & McGill-Franzen, 2021) and numeracy (Singh et al., 2015).* [Report B4.3]

- *Intervention programmes, whether school-based, or school-wide, should continue beyond the period of initial reading and numeracy instruction (Infants to Second Class), in recognition of the increased literacy and numeracy challenges experienced by disadvantaged pupils beyond that period (e.g., Cheung et al. 2021; Dietrichson et al., 2017, 2020; Swanson et al., 2017).* [Report B4.3]

- *In response to the 3-tiered model of support, interventions need to be adjusted for non-responders and students with severe literacy and numeracy difficulties and targeted small group interventions should continue to be provided (Monei & Pedro, 2017, p.286). Use of data-based decision-making and evidence is crucial for these students (Filderman et al., 2018; Lemons et al., 2016).* [Report B4.3]

- *Culturally informed approaches should be adopted in practice and research. Attention to "what makes instruction culturally informed" is advised by gaining full knowledge of students/children before judging what is responsive to them. Including texts featuring people from varied backgrounds is only a starting point for culturally informed literacy instruction and should extend to a deeper understanding of diverse learners (Kelly et al., 2021, p.93).* [Report B4.3]

- *Socio-economically disadvantaged children who also have developmental disorders should be given priority in the allocation of instructional resources in schools as they are particularly at risk of very low achievement in literacy and numeracy (Taylor et al., 2019).* [Report B4.3]

- *For school-wide or whole-school literacy interventions in disadvantaged schools to be effective, they should be intensive (with, for example, a 90-minute daily block in primary), use research-based instructional strategies involving decoding/spelling/ orthography, morphology, vocabulary development, fluency, comprehension and writing, and provide additional tutoring for students who are not making adequate progress (Cheung et al., 2021).* [Report B4.3]

- *School leaders and teachers should be cognisant that interventions that have worked at primary level may not have the same impact at post-primary level Interventions must be developmentally appropriate. (Rose, 2011).* [Report B4.3]

- *Given the research on summer loss (Weir et al, 2017; Allington & McGill-Franzen, 2021), careful attention should be given to the design and implementation of summer reading interventions which should include research-based instructional strategies in key literacy skills, attention to reading engagement, and supplying children with self-selected books for summer reading.* [Report B4.3]

- *Given that leisure time reading, access to books and high-quality libraries in schools, classrooms and communities have been linked to reading engagement and achievement (Pribesh, Gavigan, & Dickinson, 2011; Neumann & Celano, 2001; Neumann & Moland, 2019, cited in Allington & McGill-Franzen, 2021; Mol & Bus, 2011), teachers should be provided with advice on how to stay up to date with children's literature in a range of genres, how to select literature for the classroom and specific funding provided for this purpose.* [Report B4.3]

- *High-quality libraries should be provided in highly disadvantaged communities and every effort should be made to optimise home-school-community links between libraries, schools, and families (Allington & McGill-Franzen, 2021).* [Report B4.3]

Literacy interventions for learners with reading difficulties should include:

- *Small-group instruction (Connor et al., 2014; Donegan & Wanzek, 2021; Hall & Burns, 2018).* [Report B4.6]

- *Multicomponent reading interventions that target both lower-level (foundational skills) and higher-order (vocabulary and comprehension) skills with explicit teaching (Donegan & Wanzek, 2021; Scammacca et al., 2015). Particular attention should be paid to teaching inferencing, summarising skills and text structure analysis (Ellman, 2017; Solis et al., 2021; Stevens et al., 2019; Hall-Mills & Marante, 2020).* [Report B4.6]

- *A combination of reading and writing skills within lessons (Graham et al., 2017).* [Report B4.6]

- *Explicit teaching of strategies such as mnemonic strategies, word mapping strategy (WMS), keyword strategy, graphic organisers and prompts for vocabulary development. (Kaldenberg et al., 2015; Kuder, 2017).* [Report B4.6]

- *For older struggling readers, interventions should target reading fluency and comprehension rather than phonics and basic decoding strategies (Bemboom & McMaster, 2013; Flynn et al., 2015).* [Report B4.6]

- *Development of subject-specific vocabulary/key words and provision of ample opportunities to use subject-specific vocabulary in writing/speaking/presenting (Moje, 2015) for older readers where the literacy gap widens as they move into post-primary education.* [Report B4.6]

- *Writing strategy instruction that draws on self-regulated strategy development (SRSD) (Gillespie & Graham, 2014) and use of goal setting and graphic designs to plan writing (Graham et al., 2017).* [Report B4.6]

- *Approaches to spelling that combine instruction in orthographic and morphological structure of words as well as phonics (Galuchka et al., 2020), one-to-one intervention that is focused and suitably paced (Wanzek et al., 2016). Traditional individual intervention for severe spelling difficulties should not be substituted for computer-based approaches (Galuschka et al., 2020; Wanzek et al., 2016).* [Report B4.6]

- *Where appropriate, explicit approaches and direct instruction to teach discrete skills, in the context of a behavioural or applied behaviour analysis approach to instruction (Hawkins-Lear & Grisham-Brown, 2019; Root et al., 2020).* [Report B4.6]

- *Sustained attention to subject-specific vocabulary/key words with ample opportunities for students at post-primary to use subject specific vocabulary in writing/speaking/ presenting (Moje, 2015).* [Report B4.6]

- *Fluency or repeated reading interventions at post-primary which should incorporate the opportunity for students to preview text with a model of good reading (e.g., an adult reader or audiotape reading of the text) (Skinner et al., 1997).* [Report B4.6]

Numeracy interventions for learners with additional needs in mathematics should:

- *Include multiple representations (pictures, talk, symbols) to teach mathematics content, especially with learners with a mathematics disability (e.g., Jitendra et al., 2016), along with explicit and systematic instruction and computer-assisted instruction (e.g., Mononen et al., 2015).* [Report B4.7]

- *Emphasise strong core pedagogy in the whole-class setting (Dennis et al., 2016), underpinned by problem-solving/problem posing interactive methodologies; use of digital and non-digital tools; and the development of metacognitive and self-regulated learning skills (Donker et al., 2014; Hodgen et al., 2018). The framework provided by Universal Design for Learning combined with co-teaching offers one route to build capacity in this area.* [Report B4.7]

- *Have an explicit focus on developing mathematical understanding (Alt et al., 2013; Arizemendi et al., 2021; Stevens et al., 2018; Powell et al., 2020) and integrate the development of executive functioning, metacognitive strategies and spatial reasoning into teaching and learning experiences (Lawson, 2018; Singh, 2015).* [Report B4.7]

- *Challenge or support children at different achievement levels and avoid homogeneous ability grouping or streaming (Deunk et al., 2018; Peltier et al., 2017; Rolfhus et al., 2013; Stevens et al., 2018) and consider the use of cross-age peer tutoring (Alegre et al., 2019).* [Report B4.7]

- *Consist of elements identified as leading to success: assessment of the learners' current mathematical performance and develop a profile of strengths and areas for development; adopt a developmental approach, using knowledge of learning trajectories for key areas; careful planning; professional development for staff involved and use of games to increase motivation and to reduce fear and anxiety (Dowker, 2019).* [Report B4.7]

- *Incorporate the use of concrete materials and virtual manipulatives as supports for learning key mathematical concepts as well as new and emerging resources such as the use of instructional technology, computer assisted, augmented reality and video modelling (Bowman et al., 2019; Cox & Jimenez, 2020).* [Report B4.7]

- *Include specific interventions for learning of fractions given its key role in understanding further mathematics (Ennis & Losinski, 2019) and place increased focus on algebra at post-primary level (Lewis & Fisher, 2016).* [Report B4.7]

- *Build on learner strengths through use of the following teaching and learning strategies to support students with autism: priming (adding predictability to tasks), peer supports, video modelling, graphic organisers, self-management strategies, explicit strategy instruction, visual supports, task analysis, teacher modelling and providing opportunities for practice (Cox & Jimenez, 2020).* [Report B4.7]

- *Employ systematic instruction, task-analytic instruction, system of least prompts, constant time delay, and simultaneous prompting, for learners with more complex developmental needs (Bowman et al., 2019; Cox & Jimenez, 2020).* [Report B4.7]

Youthreach

- *Consistent access to literacy and numeracy supports that provide appropriate teaching and learning strategies should be available through the lifespan to improve outcomes for young adults with educational disabilities (Moni et al., 2018).* [Report B4.4]

High achievers

- *Students with high achievement in literacy and/or numeracy at primary level, including those in DEIS schools, should be tracked at post-primary level to ensure that they are supported in reaching their potential (Montacute, 2018).* [Report B4.10]

- *Efforts should also be made to increase the proportions of students from under-represented groups among high achievers in literacy and numeracy. These include students with low socioeconomic status, female students, those with ethnic minority status and dual exceptionality students.* [Report B4.10]

- *Stronger, more focused efforts should be made to raise overall standards in mathematics, as this is likely to result in an increase in the proportion of high-achieving students. Data from TIMSS mathematics at primary level and PISA mathematics at post-primary level suggest that there is considerable scope for raising overall standards in mathematics (Mullis et al., 2020; OECD, 2019).* [Report B4.10]

Travellers and Roma

- *Language Support for students and parents is essential in ensuring education is accessible to members of the Roma and Travelling communities. Recognition and support of the bilingual/multilingual abilities of these students can be expected to impact children's achievement.* [Report B4.5]

Deaf and Hard of Hearing (DHH)

- *Explicit instruction in the various components of reading should be provided to DHH pupils. Phonological awareness is essential, though not sufficient, for DHH pupils to learn to read (Alasim & Alqraini, 2020; Andrews & Wang, 2015) and explicit phonological instruction, supplemented by Visual Phonics, is recommended. Teachers should emphasise language skills in reading instruction. Morphographic analysis instruction may provide an alternative avenue for students in word reading (Trussell & Easterbrooks, 2017).* [Report B4.9]

- *Vocabulary development should be supported by repeated reading with structured instruction (Crowe & Guiberson, 2019; Davenport et al., 2019; Wang & Williams, 2014). Enhanced storybook interaction and shared reading may be beneficial (Crowe & Guiberson, 2019), especially for pre-school children (Entwisle et al., 2016) and for DHH English-language learners (Cannon & Guardino, 2012). Peer language modelling may also benefit DHH pupils' language development (Crowe & Guiberson, 2019).* [Report B4.9]

- *Reading comprehension approaches including explicit instruction, story grammar instruction, modified Directed Reading Thinking Activity, activating background knowledge, and use of well written, high-interest texts are recommended (Wang & Williams, 2014). Comprehension, Check and Repair strategy has had positive findings but does not constitute an evidence-base (Crowe & Guiberson, 2019).* [Report B4.9]

- *Further research is needed in the effective assessment and evaluation of DHH language (Bennett et al., 2014) and literacy (Lam et al., 2020) skills. Consideration is needed for appropriate assessment methods. Signed reading fluency should not be taken as an equivalent measure of oral reading fluency (Lam et al., 2020) and may not be an appropriate accommodation for testing. Maze tests may prove more reliable and valid for DHH learners, though this diminishes somewhat with older cohorts – further evidence is needed.* [Report B4.9]

Vision Impairment

- *For students with a vision impairment, it is recommended that there should be a focus on both access to learning and learning to access in relation to print. Access to learning includes the preparation of bespoke materials, the use of low vision devices and technology, the teaching of braille as well as the use of speech technology. For writing, the use of scribes, touch typing, and computers with access technology are recommended (Douglas et al., 2019).* [Section B4.8, this report]

- *There is a need to tailor the particular media for access and participation be it, augmentative and alternative communication, braille, moon or print (Douglas et al., 2019).* [Section B4.8, this report]

- *Students where appropriate should have access to specialist technology including specialist braille codes (Nemeth Code) for mathematics (Douglas et al., 2019) and the use of refreshable braille technology (Douglas et al., 2019).).* [Section B4.8, this report]

Pillar 6: Improving Assessment and Evaluation to Support Better Learning in Literacy and Numeracy

Literacy, Numeracy and SEN

- *Learning trajectories coupled with the 'learning story' format of documentation should be implemented in literacy and numeracy assessment as together they form a strong framework for educators assessing mathematical activity in ECEC contexts (Perry & Dockett, 2013; Gillic, 2020).* [Paper B2.1a]

- *Promote rich and accommodating inclusive differentiated strategies targeted to the individual needs of the learner, as part of a whole school approach (Clements & Sarama, 2014; Deunk et al., 2018). [Paper B2.1b]*

- *In interpreting assessment outcomes, teachers should be cognisant of external factors that may influence mathematical performance such as low socioeconomic background, English as an additional language, reading difficulty or maths anxiety (Castro-Olivo et al., 2011; Ramirez et al., 2013; Alt, 2014; Cason et al., 2019; Powell et al., 2020),* [Paper B2.1b]

- *Due regard should be given to learning outcomes in component disciplinary areas of cross-curricular integration and authentic assessment should be devised which evaluates learners' success in achieving integrated learning intentions (Gao et al., 2020).* [Paper B2.3]

- *Digital assessment tools that provide adaptive assignments in literacy and numeracy to students based on their previous assessed performance should be used as part of a broader learning experience for those with additional learning needs (Lane et al., 2019; See et al., 2021).* [Paper B3.2]

Assessment in Early Childhood

- *Holistic assessment. The argument is made through the literature for the use of holistic and purposeful assessment approaches and process in early childhood (developmental and academic) (DeLuca et al., 2020; Alasuutari et al., 2014; Visser et al., 2012; Ebbeck 2014) to ensure a comprehensive picture of children's competencies.* [Paper B3.1]

- *Engagement of children and families with assessment. Assessment in early childhood should draw on multiple methods and sources of information (LouiseMarbina 2015; Conlon 2002). Children's perspective and voice should be included in assessment (Buzzelli 2018) and their parents also have a critical role in contributing to assessment processes (Verdon et al., 2018; Carr & Lee 2012; Alasuutari et al., 2014; Visser et al,. 2012).* [Paper B3.1]

- *Inclusive assessment. Assessment and language assessment specifically must be culturally and socially responsive, specifically for children from diverse backgrounds (Conti-Ramsden & Durkin 2012). There are ongoing shortcomings in assessment instruments as they relate to dual language learners (Soto et al., 2019). A skilled-based approach to assessment often fails to capture the social and cultural practices of linguistically diverse communities' (Yoon, 2015, p. 365) because narrow assessment tools effectively marginalise those children with non-standard language practices (Holmes 2017).* [Paper B3.1]

- *Children with special needs. There is a need to develop an appropriate set of assessment instruments for young children with special needs, specifically for those younger than 4 years of age. Instruments available for the developmental assessment of children with motor impairments, for example, have insufficient reliability and there is a need to further research the alignment of test results with intervention plans (Visser et al., 2012).* [Paper B3.1]

- *Literacy assessment. While many instruments are available to assess young children's language (Verdon et al., 2018), current assessment approaches do not adequately evidence the complexities of literacy development. Language assessment of young children should view the child holistically and include a thorough consideration of other areas of functioning (Conti-Ramsden & Durkin 2012). Visser et al. (2012) posit the value of combining standardised test results with information from qualitative instruments, for example observations and parent reports. Teale et al. (2020) caution that early literacy assessment requires further study and warns against the overuse of assessments in preschool.* [Paper B3.1]

- *Numeracy assessment. There is a dearth of literature, specifically systematic reviews or literature reviews, in relation to the assessment of mathematics in early childhood. Further research is required into broadening notions of what counts as mathematics and how mathematics can be taught to young children (Johnson et al., 2019). In addition, a broader range of assessment tools that specifically address numeracy in early childhood must be developed (Johnson et al. 2019; Franke, et al., 2020), cognisant of understanding not only discrete mathematical skills but also mathematical thinking and language. The interaction between age, culture, home numeracy and mathematical skills is worthy of further investigation given the home influence on the developing child (Mutaf-Yildiz et al., 2020).* [Paper B3.1]

Formative Assessment at Primary and Post-Primary Levels

- *Elaborated feedback. In general, feedback on literacy and numeracy tasks should be elaborated, that is, it should be accompanied by an explanation. In particular, feedback should be aimed at strategies that bridge the gap between where students are and where they need to be, while promoting metacognition and self-regulated learning (Hodgen et al., 2018; Schildkamp et al., 2020; Van der Kleij et al., 2015).* [Paper B3.2]

- *Self- and peer-assessment. Opportunities for self- and peer-assessment in literacy and numeracy should be identified by teachers and incorporated into the learning process. Criteria for such assessment should be concrete, task-specific, and graduated, and should be developed in conjunction with students Support should be provided to younger children to engage in the processes of self- and peer-assessment. Where appropriate, students should engage in self-grading; however, grading by peers is not encouraged for primary or post-primary students (Andrade, 2019; Double et al., 2019; Sanchez et al., 2017).* [Paper B3.2]

- *Exemplars. A range of relevant exemplars in literacy and numeracy should be made available to teachers and students to support them in interpreting learning trajectories and student-facing checklists (Calkins et al., 2019; Hodgen et al., 2020).* [Paper B3.2]

Identifying High-Achievers and Highly Able Students

- *Standardised measures. The assessment of high achievement in literacy and numeracy should be based on performance on standardised measures of achievement in these areas (Montacute, 2018). In the case of mathematics, attention should also be given to performance on measures of spatial reasoning, as well as measures of confidence and/or anxiety.* [Paper B4.10]

- *Observations. The observations of teachers and parents should also be taken into account in identifying children with high achievement, or the potential for high achievement (Cullen al., 2018).* [Paper B4.10]

- *Cut-off Points. Where hard cut-off points are used to identify highly able students (e.g., those eligible for support programmes), allowances should be made for low-SES students who may have unrealised potential for high achievement (Montacute, 2018).* [Paper B4.10]

Summative Assessment

- *Consideration should be given to implementing standardised tests of literacy and numeracy at the end of Second year in English- and Irish-medium schools, as envisaged in the 2011 National Literacy and Numeracy Strategy, since no other objective information on performance is available at that stage. The requisite tests have already been developed and are available online, and schools should be supported in implementing them, and in interpreting the outcomes to support planning at school and individual student levels.* [Paper B3.3]

- *The National Assessments of English Reading and Mathematics at primary level should be expanded to include an assessment of digital literacy at Sixth class, as envisaged in the 2017 Interim NLNS Review. Assessments of online and paper-based writing should be administered in a subsample of schools.* [Paper B3.3]

- *Any modifications to the current system of implementing and reporting on the outcomes of standardised tests in Second, Fourth and Sixth classes in primary schools should be handled carefully so that such tests do not place additional constraints on teaching and learning, or on the wellbeing of stakeholders (see O'Leary et al., 2019). However, practices in other countries around the reporting of individual and group progress over time (for example, use of student growth percentiles) should be considered. There would also be value in contextualising aggregated student performance, by, for example, using virtual comparators (pseudo schools with similar socioeconomic characteristics). These approaches could help to ensure that schools and teachers can access better performance data to support data-based decision making.* [Report B3.3]

- *The development of short, online interim assessments across a range of areas in literacy and numeracy should be considered, beginning with primary level. These assessments, comprising short tests in specific areas (e.g., informational texts in reading, fractions in mathematics) would be used by teachers on a needs basis throughout the school year, to support them in targeting instruction in literacy and numeracy.* [Paper B3.3]

- *The practice in Ireland of allowing the use of multiple tests and aggregating outcomes across tests at national level is unusual by international standards. The administration of single secure, regularly updated tests in reading and mathematics in the languages of instruction across all schools is preferable and this can be facilitated by technology.* [Paper B3.3]

- *The affordances of technology to facilitate adaptive testing, where students are provided with sets of test items based on their own ability, should be considered where computer-based testing is available, as this is likely to make testing a more positive experience for students (including some with special education needs) and provide greater clarity on the performance of high- and low-achieving students.* [Paper B3.3]

- *Consideration should be given to reporting descriptors of achievement, alongside test scores in testing programmes. These are similar to the proficiency levels in NAMER. Descriptors such as 'working towards expectations', 'partially meeting expectations', 'meeting expectations' and 'exceeding expectations' may be useful to stakeholders, in terms of understanding the needs of students relative to expectations for their class level, and allocating instructional support.* [Paper B3.3]

- *In line with recommendations in earlier Irish studies (e.g., Douglas et al., 2012), efforts should be made to make large-scale assessments such as the National Assessment of Mathematics and English Reading (NAMER) more inclusive, so that all students, including those with special education needs, can participate. Accommodations can include additional time, adaptations to tests, prompters, accessibility objects in mathematics, and aural input. The expansion of computer-based testing should facilitate some of these.* [Paper B3.3]

- *Alternative approaches to assessment should be made available to cater for students who are currently exempted from taking standardised tests at the end of the Second, Fourth and Sixth classes at primary level. These might include alternative assessments of literacy and numeracy, teacher-based assessments, and, where such assessments are not relevant, assessments of underlying learning skills such as communication, initiation and persistence. Outcomes should be reported to the DE alongside regular results, so that a record of the literacy and numeracy skills of all students in a school is available in aggregated form.* [Paper B3.3]