



Characteristics associated with paper-based and online reading in Ireland: Findings from PIRLS and ePIRLS 2016



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ABSTRACT

Online reading necessitates the use of both similar and different skills to traditional paper-based reading. Therefore, some overlap is likely in the background and attitudinal factors associated with reading in the two modes. This study uses a multilevel framework and data from the Progress in International Reading Literacy Study (PIRLS, 2016) to explore the characteristics associated with online and paper-based reading in Ireland. Of independent variables examined, pupil reading confidence has the largest effect size for both PIRLS and ePIRLS. Home background variables have similar effect sizes for the two outcomes. Differences between the models emerge regarding time spent browsing the internet, the frequency of using a computer at school, pupil enjoyment of reading, and pupil ownership of a smartphone.

1. Introduction

Recent years have seen major changes in children's reading practices, with more reading now taking place in a digital environment, often in online, multimodal contexts involving the integration of text with images, videos, and audio files (Ng & Bartlett, 2017). Rideout, Foehr, and Roberts, (2010) reported that American students (8–18 year olds) spent three times as much time reading on a digital device as they spent reading traditional, printed materials, a gap that is unlikely to have reduced in the intervening years.

There are many similarities between the processes involved in print and digital reading, and the mode in which a test is presented has been shown to have a comparatively small effect on reading test performance. A meta-analysis examining the effect of test mode (pencil-and-paper or computer-based) showed no statistically significant effect on reading achievement scores (Wang, Jiao, Young, Brooks, & Olson, 2007), although it has been argued that for tests involving extensive reading passages, performance is lower on computer-based tests (CBT) compared to paper tests (Paek, 2005).

However, until recently, most comparisons of digital- versus paper-based reading have tended to focus on digital texts in a general sense (i.e., including pdfs, Word documents, etc.), rather than specifically analysing differences associated with reading in an online, internet environment. Yet, as Mullis, Martin, and Sainsbury (2015) note, internet reading is gradually becoming one of the main ways in which pupils acquire information, so educators are particularly interested in how children read in an online environment, and how “transferable” reading comprehension skills are from paper to online. There is increasing evidence that while reading successfully in an online environment requires many of the same general comprehension skills and strategies as reading on paper, they may be used somewhat differently to how they would be used in a traditional text environment.

Coiro and Dobler (2007) found that compared to a print environment, students reading online used both similar and more complex applications of strategies for inferential reading and for self-regulation. Students also used more complex applications of

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prior knowledge from four sources: the topic; printed informational text structures; informational website structures; and, web-based search engines. Research suggests that successful internet reading requires making strategic decisions about what texts to read and a sequence for reading them (Cho & Afflerbach, 2015), and that some online reading skills do not have a paper equivalent, particularly in relation to evaluating reliability of information (Afflerbach & Cho, 2010). As such, as Leu (2017) noted “By gathering information about the online reading ability of fourth grade students, we generate greater awareness and understanding of these differences and that allows us to introduce classroom experiences to develop proficiency in the additional areas required for online reading”.

This paper draws on data from the 2016 Progress in International Reading Literacy Study (PIRLS, (Mullis, Martin, Foy, & Hooper, 2017; Mullis, Martin, Foy, & Hooper, 2017) to explore the extent to which there is variation between paper-based and online reading in terms of the characteristics associated with reading achievement. As this is the first multivariate analysis of the PIRLS 2016 dataset in Ireland, an exploratory approach is adopted whereby numerous explanatory variables are considered and used in the modelling process. The main research questions addressed in this study are:

What are the predictors of reading achievement as measured in paper-based format (PIRLS)? What are the predictors of reading achievement as measured in online format (ePIRLS)? What, if any, are the differences between the predictors of achievement for each mode of assessment?

More specifically, we examine if 1) similar associations are found between characteristics of the child’s home background and home climate and achievement in paper and online reading, 2) use of a computer at home or school is differentially associated with paper and digital reading, and 3) reading attitudes and engagement are differentially associated with paper and digital reading, and 4) if school or class characteristics are differentially associated with paper and digital reading.

The remainder of this paper is structured as follows. Section 1.1 briefly reviews research on associations between pupil and home background characteristics and academic achievement. Section 1.2 considers the association between computer usage and academic achievement. Section 1.3 outlines how reading is assessed in PIRLS, and in a related, but separate, digital assessment called ePIRLS. Section 1.4 describes Ireland’s performance on PIRLS and ePIRLS. Section 2 presents the data and method used in the current study. Section 3 describes the results of the analysis. Section 4 provides a more detailed discussion of the results.

1.1. Pupil and home background factors associated with achievement

Across different age groups and assessments, gender differences in favour of girls have been found for both print and online reading (e.g., Mullis et al., 2017a, 2017b; OECD, 2016b). Using data from over 30 countries, Gustaffson, Hansen, and Rosén (2013) suggest that one explanation for the achievement advantage of girls in reading is a stronger emphasis placed on literacy skills in the homes of girls compared to boys prior to starting school. In almost all the countries they examined, parents reported a stronger emphasis on early literacy activities than early numeracy activities when their child was a girl compared to when their child was a boy. Also, in some countries, including Ireland, parents reported a higher frequency of books at home for girls than boys (although this could be attributable to the child rather than the parents). An analysis of gender differences in performance on international reading assessments across age groups in Nordic countries (Solheim & Lundetræ, 2018) found that the magnitude of gender differences may be associated with features of the assessment, including text type (e.g., fiction/non-fiction, continuous/discontinuous), item format (multiple choice or constructed response), aspects of reading assessed (e.g., reflecting on text, interpreting text or retrieving information), and study implementation (e.g., approach to sampling, assessment duration).

Characteristics of pupils’ home environments have been consistently shown to be associated with academic achievement. For example, across international contexts and studies, and using different outcome domains, positive associations are almost always found between parental education, parental income, access to books in the home, and academic achievement at both primary (e.g., Kavanagh, Shiel, Gillece, & Kiniry, 2015; Mullis, Martin, Foy, & Drucker, 2012; Mullis, Martin, Foy, & Hooper, 2016; Mullis, Martin, Foy, & Hooper, 2016; Mullis et al., 2017a) and secondary level (e.g., OECD, 2016b). Numerous theories have been used to attempt to explain the relationship between socioeconomic status and achievement, including Bourdieu (1977) concepts of economic, cultural and social capital. Cultural capital incorporates the skills, attitudes, and use of language, as valued in the education system. Higher levels of parental education and higher status occupations are associated with higher levels of cultural capital. Children who start school with higher levels of cultural capital are better positioned to benefit from the education system as there is a better match between their home and school environments. Educational studies operationalise measures of the various types of capital in different ways but typically employ measures of parental occupation, home educational resources and indicators of material wealth, and the number of books in pupils’ homes (e.g., Hooper, Mullis, & Martin, 2015; OECD, 2016b).

Turning to attitudinal factors, Ng and Graham (2017) review the role of motivation, self-efficacy, and reading engagement in predicting reading achievement and note that reading motivation accounts for unique variance in reading comprehension over and above the variance explained by other variables. They also note that reading motivation is a multidimensional construct, incorporating competence beliefs, extrinsic reasons, and social purposes for reading. Motivation constructs have been shown to be semi-independent, with motivation for reading narrative texts somewhat distinct from motivation for informational texts (Guthrie et al., 2007).

1.2. Computer use and academic achievement

Not surprisingly, given the myriad of potential uses for computers in the classroom, there is not a simple association between computer usage at school and academic achievement. For example, a cross-national analysis of the reading achievement of fifteen year olds found that students who made below-average use of computers at school had the highest performance in digital reading

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