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The role of media in PISA 2022 mathematics education policymaking in Anglophone countries

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ABSTRACT

As governments react to international rankings, the Organisation for Economic Co-operation and Development's Programme for International Student Assessment (PISA) of 15-year-old students has arguably influenced many governments' mathematics education policies. In this paper, we look at the relationship between the latest cycle of PISA, policymaking and media in the economies where English is an official or substantial working language (Anglophone countries). We analysed three sources of media responses to PISA 2022 results, from governments, mainstream media, and social media, focusing on the number of the reactions, the sentiment of the reactions, and some relevant themes pertaining to PISA 2022 mathematics coverage. The results show that the PISA results have been used and discussed differently by different governments and that media responses seem to relate to pertinent policy objectives. Our contribution sheds light on how the PISA 2022 results interact with policymaking for mathematics education in Anglophone countries.

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Introduction

The Programme for International Student Assessment (PISA) is one of the most influential international large-scale assessments (ILSAs), with 81 participating countries and education systems in 2022. Each cycle, the international results are published on what has become known in many countries as "PISA day". Since the first cycle of PISA in 2000, the PISA results have influenced education policy around the world in a variety of ways. As Volante and Mattei (2024) argue, using PISA to justify educational policy reforms enables politicians to avoid the need for an evidence-based justification for the reform and limits the potential critiques. Indeed, the reporting of the outcomes of ILSAs such as PISA is more about politics than the performance itself (De Lange, 2007). In the last decade, an increasing amount of research has focused on the

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mediatisation (Lundby, 2009) of education policy and practice, with most recently an increasing influence of social media in modern policy processes (Baroutsis & Lingard, 2021). The OECD and its PISA programme are a key component of this complex relationship between education policy development, reform and the media. The starting point of this paper is that engagement with PISA can be construed as a policy engagement pipeline: results are first presented by governments, after which media and social media reactions may be viewed as responses to policy events, which in turn might again influence government policy. However, the focus of reporting PISA results and their prominence and influence in both the media and in policy reform have evolved since PISA's inception. Although every PISA cycle reports on results for three subjects, mathematics, reading and science, each cycle has a specific focus. The most recent cycle, PISA 2022, focused on mathematics, and is therefore suitable for a more in-depth analysis of the relationship between PISA results and mathematics education policymaking. A priori, we did not anticipate the extent of mathematics focused reporting of the PISA 2022 results, and so this study analyses those aspects that focus on mathematics education. In this paper, we look at the relationship between the latest cycle of PISA, policymaking and media responses in the economies where English is an official or substantial working language (Anglophone countries). We analysed three sources of reactions in relation to PISA 2022 results, from governments, mainstream media and social media, as their reactions occur in the public domain. We analyse the reactions in relation to the number of the reactions, the sentiment of the reactions, and the focused themes and topics of PISA 2022 coverage. We expected that, given the focus on mathematics, this would yield mathematics specific insights. However, surprisingly, this was not the case. We therefore also conducted a follow-up mathematics-oriented analysis. This analysis is reported as a case example, where we dive deeper into mathematics education related responses in the United Kingdom, highlighting the inter-related ways in which policy is created and how media responds, as well as explore specific mathematics education policy jargon. We now first review the literature on PISA and the media, its role in policymaking and the relationship between PISA and mathematics education.

PISA and mathematics education

The original mathematics framework for PISA drew heavily on Realistic Mathematics Education (RME), with its strong focus on modelling and problem-solving (Niss, 2015; Stacey & Turner, 2015). Although part of the mathematics framework since 2003, in 2012 PISA began reporting the mathematics results in terms of the different aspects of the mathematisation, problem-solving or mathematical modelling cycle (Stacey, 2015). This evolved again in 2022, the next time that mathematics was the major domain, to include mathematical reasoning as a core process of this modelling cycle (Ingram et al., 2024; OECD, 2023b). As countries reformed their mathematics curricula in response to PISA results, this often resulted in a stronger focus on these aspects of modelling and problem-solving (Burkhardt, 2014) and the mathematical competencies included in the PISA mathematics frameworks.

The mathematical literacy described by the PISA mathematics frameworks serves as an "exemplary curriculum type" (Tsatsaroni & Evans, 2013, p. 12) of what students need to learn and be able to do. While PISA emphasises mathematical literacy and the

ability to use and apply mathematics in real-world contexts, curricula around the world vary in terms of the inclusion of the need for students to be able to use mathematics to solve real-life problems (Smith & Morgan, 2016). Observation studies of mathematics teaching have also shown variability in both the quantity (e.g. Ingram et al., 2020) and nature (Rubel & McCloskey, 2021) of real-life contexts in the teaching of mathematics. It will be interesting to see the impact of the most recent PISA mathematics framework, with its inclusion of computational thinking and mathematical reasoning, on mathematics curricula in response to the reported results. In addition to problem-solving processes, PISA also reports on four content domains; Quantity, Change and Relationships, Space and Shape, and Uncertainty and Data. Curricula reform based on these content domain has been less visible in the literature discussing the impact of PISA, despite noticeable differences in the relative performance across the different content domains in several economies (Bokhove et al., 2019; Ingram et al., 2024; Ingram et al., submitted). Much of the curricula reform related to this content has focused on students' opportunity to learn (OTL) (Bokhove et al., 2019; Schmidt et al., 2014, 2021), both in terms of the time spent learning different topics and content areas, and in terms of the range of topics and content areas taught in schools.

Mathematics curricula reform has been influenced by PISA in a range of countries (Shimizu & Vithal, 2023). However, this influence has both positive and negative impacts (Kilpatrick, 2023). While countries learn more about what their own mathematics curriculum looks like in comparison with other countries, PISA itself focuses on a particular definition of mathematical literacy, heavily influenced by Western approaches to mathematics education (Komatsu & Rappleye, 2021). Implicit in countries' desire to reform mathematics curricula to improve performance in PISA is the assumption that curricula should address all aspects of mathematical literacy as defined in the PISA mathematics framework. Yet, while PISA and TIMSS have different foci, Jablonka (2015) argues that the PISA assessment is a mathematics assessment "disguised as an assessment of mathematical literacy" (p. 601) and Kanes et al. (2014) argue that it actually evaluates school mathematical skills. Arguably then, PISA can only tell us how students perform on the particular aspects of mathematics or mathematical literacy the included items measure, which may miss some important aspects of mathematics that countries excel at (Kilpatrick, 2023).

PISA does not just report on mathematics performance and difference in performance between different groups of students. It also includes a range of indices related to students' attitudes and experiences. It is these attitudes and experiences that have featured more prominently in debates around some countries' PISA results. For example, curriculum reform in South Korea was followed by media and policy concern with students' attitudes towards mathematics (Lew et al., 2012), and reporting in Singapore, which often features in the top 5 countries in the published rankings, focused on students' risk taking and wellbeing (Crome, 2022). In taking this study forward, we focus on PISA 2022, with its focus on mathematics in this round, and ask: What is the role of media in PISA 2022 mathematics education policymaking?

PISA and the media

The media attention on the PISA results brings education policy into public conversation and debate (Schleicher & Zoido, 2016). After the OECD and national reports themselves, the media is the primary means through which the PISA outcomes are translated into public knowledge and framed as the basis for policy reform. In some countries, policy-makers and academics engage strategically with the PISA reports to influence the interpretation of the results and the subsequent policy reform (Hamilton, 2017). While media and politicians in some countries widely report the PISA results in terms of evidence of a crisis and need for educational reform, in others, the tone is more of one of national pride, and in yet others there is a sense of indifference (Baird et al., 2016; Baroutsis & Lingard, 2017). These reports differ across cycles depending on a range of factors such as performance and educational priorities in each country (Baird et al., 2016; Lewis & Lingard, 2022). Despite this widespread and strategic reporting of the PISA findings, policy is often still driven by political priorities rather than the empirical evidence presented (Green Saraisky, 2019; Hamilton, 2017).

Most academic studies examining attention to PISA have focused on either policy-makers or the media, and have often considered one or two economies. Early studies looking at media attention on PISA identified that poor results were more likely to be reported (Baroutsis & Lingard, 2017; Martens & Niemann, 2010), which also resulted in the term "PISA-shock", widely used to describe economies that reformed their education policies in light of poor performance in PISA (Ertl, 2006; Nortvedt, 2018; Volante & Mattei, 2024), with the media portraying an economy's education system as in crisis (Grey & Morris, 2018). In their analysis of social media microblogs immediately around the main reporting of PISA in 2015, Baroutsis and Lingard (2021) identified a distinction between the OECD's role as providing information and promoting the PISA results, and academic and teacher union voices providing debates, opinions and more critical analysis.

More recently, Jerrim (2024) identified a decline in media attention to PISA results, though with considerable variation across countries. This analysis also showed the longer-term impact of earlier media attention on poor results, with three European nations that experienced "PISA-shock" continuing to receive higher levels of media attention than most participating countries. In contrast, Giberti and Maffia (2020) showed increasing attention to PISA in mathematics education research, with twice as many journal articles focused on mathematics education within countries compared to comparisons between countries. Similarly to its use in policy-making, PISA was largely used by researchers to justify the need for change, that is new research. Yet about 10% of the analysed articles and papers related the PISA results to the development of national mathematics curricula.

As Volante and Mattei (2024) argue, using PISA results in policy-making and reform requires both framing and persuasion strategies. The Media has a central role in framing discussions around the data that arises from PISA and media reports are usually interpretive (Crome, 2022). The OECD itself uses persuasion to influence policy, using the data generated through PISA to set agendas and priorities (Seitzer et al., 2021), investing significant resources in its media resources (Addey et al., 2017). According to Barwell and Abtahi (2019), news reporting on mathematics education is particularly concentrated on

international comparison results, with the publication of these likely leading to policy changes. Chorney et al. (2016) show that the notion of competition (e.g. in rankings) can be found in the international context as competition between economies. This, for example, is apparent in storylines identified by Rodney et al. (2016): "Canadian students are getting worse in mathematics" (p. 399) or references to a "general sense of decline" (Barwell & Abtahi, 2019, p. 309).

PISA and policy

ILSAs, including PISA, connect measures of performance in key areas such as mathematics to contextual aspects of school accountability, student attitudes and teaching quality, and promote the importance of international comparisons in education policy making (Addey et al., 2017). PISA is designed to inform the decision making of policymakers. The design and the comparative nature of PISA feed public accountability, largely through media reactions, as well as peer pressure with the increasing globalisation of education (Schleicher & Zoido, 2016). Through PISA and other reports, OECD does not directly tell economies what education policies "work", but focuses on reporting what other successful economies are doing (Schleicher & Zoido, 2016), with OECD deciding what aspects of the study tell this story of success (Rutkowski, 2007). While economies technically have the choice of whether to participate in PISA, multiple drivers for participation in effect make it difficult for economies to abstain, even given the substantial financial commitment needed to participate. PISA does not just generate evidence or policy for informing curricula, it can also trigger financial aid, and enhance international relations (Addey et al., 2017).

OECD strategically disseminates PISA results to promote their narrative of what educational success should look like, making use of a wide range of formats, such as timed press releases, infographics, webinars and social media posts. OECD also staggers different reports of PISA, prioritising the overall performance and findings related to equity and other findings that OECD wants to draw attention to, while delaying or relegating to different volumes the more technical reports and less attention-grabbing or less agenda-relevant results, such as performance on the different aspects of the mathematics framework. In 2022, this prioritisation included the impact of the Covid-19 pandemic, and the role of mobile phones on both learning and students' wellbeing, while other previously emphasised aspects, such as growth mindset in 2018 or academic resilience from 2009, receiving far less attention. The press releases and outputs from OECD were closely followed in media's own reporting, with little critical engagement (Pons, 2011). Moreover, policy reform predominantly focused on performance in PISA rather than equity (Volante & Mattei, 2024), despite an increasing emphasis on educational equity. New assessments on an "innovative" domain, such as financial literacy and creative thinking, also received far less attention by politicians and media.

PISA has driven education reform in many economies (Baird et al., 2011; Carnoy et al., 2016; Ertl, 2006), as it promotes the idea that economies can look to more successful countries to borrow best practices (OECD, 2024). Over the years, there have been examples of this policy borrowing, accompanied by an increasing focus of research (Pons, 2017; Volante & Klinger, 2023). Some economies directly reference the more successful economies in their policy reforms (e.g. Japan (Takayama, 2010), Sweden (Lundahl

& Serder, 2020) and England (Department for Education, 2010)). In England, the reforms to the mathematics curriculum were described by policymakers as needed in order to put England's mathematics curriculum "on a par with the best in the world" (Vasagar, 2011) with Michael Gove looking East in his justification of the reforms (Gove, 2011). This comparison with other jurisdictions was visible in national media (Davis et al., 2018; Liu, 2018) as well as national reports (e.g. Ingram et al., 2023). However, policy reforms are often justified through selective use of PISA results (Lundahl & Serder, 2020; Volante & Mattei, 2024), often only using PISA to validate existing policy plans (Nortvedt, 2018). Social media contributes to this confirmation bias as users largely follow users and topics that interest them (Baroutsis & Lingard, 2021).

There also are debates, largely among academics, as to the extent to which policies and practices can be implemented in different socioeconomic and cultural contexts (Meyer & Schiller, 2013), as well as the role of cultural factors in mathematics achievement (Hu et al., 2018). Jerrim (2015) for example, cautioned against policy borrowing without considering the cultural shifts needed that may explain the success of these policies in other economies. Yet, these debates are rarely visible in media reporting, and when addressed by OECD they are usually relegated to technical reports, read by few.

The influence of PISA on national policies has also been critiqued for focusing attention on short-term fixes, measurable educational objectives and the economic role of education policies (Andrews et al., 2014; Zhao, 2020). It has also been argued that ILSAs have had a key role in the homogenisation of education systems (Sivesind et al., 2024; Verger et al., 2024), including national curricula, assessments, and teaching practices (Lundahl & Serder, 2020; Nortvedt, 2018). Volante and Mattei (2024) give examples of Germany, Canada and Ireland where national assessments have been revised to mirror PISA. There also have been recent calls to move away from this one view of effective education systems towards the recognition of alternatives (Komatsu & Rappleye, 2021).

The current study

Given the influence of PISA, we aimed to investigate how PISA 2022 mathematics results have influenced policymaking in Anglophone countries by analysing media presentations and discussions. In doing so, we focused on three groups of media actors: the government who commissioned the national PISA study, the mainstream media, and social media outlets. Our research questions were:

1. What is the extent of PISA 2022 coverage in Anglophone countries from a government, mainstream media and social media perspective?
2. What sentiments does PISA 2022 coverage express in Anglophone countries from a government, mainstream media and social media perspective?
3. What themes and topics do PISA 2022 sources cover in Anglophone countries from a government, mainstream media and social media perspective?

These questions address both the extent to which PISA results are used in debates around education policy in the different economies and how the results are used to challenge or justify existing policies or further reform. We note that PISA 2022 had a specific

mathematics education focus, but that we looked more widely at its influence, before drilling down into mathematics education specifically.

Methodology

This section describes the methodology behind our content analysis. We first explain what economies we included, then our data sources for the analysis, and conclude with our analysis approach.

Included economies

Our analysis of Anglophone countries includes economies where English forms a major policy language. In the main analysis we use the labelling of major economies without distinguishing sub-regions. We mainly do this because the reporting also pertains to such regions. However, in the subsequent case example and discussion we do refer to sub-regions, as educational policy sometimes is organised at the level of a sub-region.[1] We only deviate from this general strategy, when sources were only available for sub-regions. Not all economies appeared in our search results, something we indicate with a "0". The included economies are: Australia, Brunei Darussalam, Canada, Hong Kong, Malta, New Zealand, Ireland, Singapore, the Philippines, United States of America, United Kingdom, and the United Arab Emirates. Table 1 tabulates the economies and some general information about each, including the population in millions, and the average mathematics score in PISA 2022.

Data sources

In line with our research questions, we collected responses to the PISA 2022 results from four sources: (a) governments, (b) non-governmental organisations (NGOs), (c) mainstream media, and (d) social media. In practical terms, PISA work often involves a representative NGO working with governments, for example universities or research institutes, so we combined the first two categories, leaving three major categories of text sources: government, newspapers, and social media. "Reports" from a government did not include the national

Table 1. Descriptives of Anglophone countries considered in this paper.

Country	Population (in millions) [2]	PISA mathematics score [3]
Australia (AUS)	27	487[1]
Brunei Darussalam (BRN)	0.45	442
Canada (CAN)	41	497[1]
Hong Kong (HKG)	7.5	540[1]
Malta (MLT)	34	409
New Zealand (NZL)	5.3	479[1]
Ireland (IRL)	5.4	492[1]
Singapore (SGP)	6.0	575
The Philippines (PHL)	114	355
United Arab Emirates (UEA)	10.7	431
United Kingdom (UK)	68	489[1]
United States of America (USA)	335	435[1]

[1]Score has to be treated with caution because one or more sampling standards were not met.
[2]Source: https://en.wikipedia.org/wiki/List_of_countries_and_dependencies_by_population
[3]Source: https://www.oecd.org/en/publications/pisa-2022-results-volume-i_53f23881-en.html

reports, only official press releases and media expressions by the national governments regarding the results. For the case example involving the UK we also included text from ministerial speeches and UK parliament. Although we endeavoured to be as inclusive as possible for these sources, we made the following analytical choices. For all searches we used the window a month before publication of the PISA 2022 study until one month after: 5th November 2023 to 5th January 2024. We acknowledged that this time window would not enable us to look at long-term policy effects.

For the government documents we systematically visited government websites of the included economies and collected official news reports in the English language on PISA 2022. We refer to this as the "government corpus". For newspapers, we made use of the comprehensive Lexis Nexis newspaper search engine,[2] downloading all relevant newspaper items published in each economy. A separate Lexis Nexis analysis was performed on terms that were associated with the mathematics results and policy terminology.[3] To determine the extent of news coverage we kept all items, but for the content analysis we removed duplicates i.e. similar articles that were published in two or more different newspaper outlets. All newspaper items were combined in a "newspaper corpus" for each economy. Finally, we collected microblogs from the popular social media platform X (formerly Twitter) that mentioned "PISA 2022". As these tweets were not attributed to specific economies, we manually categorised them by country (22 were attributed to two economies) and whether they pertained to mathematics or not. Tweets assigned to more than one economy were disregarded. We refer to this as our "social media corpus". Note that for the time window chosen, many communications were about PISA 2022 in general, so at that point we did not specifically only include mathematics-oriented content. However, we did include a mathematics focus in the further content analysis.

Data analysis

Data analysis was conducted in three different ways. All quantitative analyses were conducted with the statistical software R (R Core Team, 2021) within R Studio (R Studio Team, 2021). Firstly, we looked at descriptive statistics for each of the three corpora. For the government corpus this was the number of words. For the newspaper corpus this was the number of news items and the number of words. For the social media corpus this was the number of words and the total number of views for the social media messages, all grouped by country. These collectively gave an impression of the extent of news coverage of PISA 2022 by country. Secondly, we looked at the *sentiments* in each of the three corpora, to uncover whether there are differences in sentiments between economies and sources. We used a lexicon-based approach in which the sentiment score for each word in our corpus was determined by reference to an external database (lexicon) of words. The AFINN lexicon (Nielsen, 2011) attributes scores between −5 and 5 to words, with negative scores indicating negative sentiment and positive scores indicating positive sentiment. Thirdly, we looked at the content in the three corpora. Initially, our intention was to use advanced computational research methods for these, but as contrary to our expectations, the corpora were quite small in sample size, these were not deemed suitable for our purposes. Only the newspaper corpus was large enough to conduct a meaningful follow-up analysis, using the "Keywords in Context"

(KWIC) approach (Manning & Schutze, 1999). KWIC focuses on the discovery of relevant text fragments in a text corpus via keywords or key phrases (see Note 3). Frequencies for all economies are included in Table S1 in the supplemental materials; in our analysis, we only unpick the numbers for the UK. A final analysis, to unpick the parliamentary context more, was conducted for the UK. Taken together, these analyses gave insights in the extent, sentiments and topical context in which the mathematics-focused PISA 2022 results received attention from Anglophone governments, newspapers, and social media.

Results

We now present the findings for each of the analyses corresponding with the research questions: descriptive statistics, sentiment analysis, content analysis, and case example of the United Kingdom.

Descriptive statistics of our three corpora

As the government corpus essentially represents only one entity, we present these separately. Also, each of the governments in the nations within the UK issues separate press releases, so these are reported here separately. The longest government press statement was provided by Ireland (1669 words[4]), the shortest by Malta and the United Arab Emirates (165 words). In increasing lengths we then further had UK: Wales (208), New Zealand (213), Canada: Prince Edwards Island (220), UK: Scotland (227), Australia (343), The Philippines (448), Canada (484), USA (530), Hong Kong (571), Brunei (660), UK: Northern Ireland (669), Singapore (761), and UK: England (771). A non-parametric correlational analysis showed a moderately strong correlation between the performance in PISA 2022 mathematics and the number of words devoted by the government to this performance (Spearman's $\rho = .548$, $p < .05$). This would indicate there was an association between performing better in PISA and advertising this performance. In contrast to the government corpus, there was a non-significant, negligible correlation between performance and newspaper attention in terms of news words (Spearman's $\rho = -.030$, $p = .934$), even when taking population into account (i.e. as one could argue that larger countries will have more news items). Similarly, number of social media words (Spearman's $\rho = -.073$, $p = .832$) also had a negligible correlation, with number of views negatively correlated with performance, but non-significant (Spearman's $\rho = -.300$, $p = .370$; Table 2).

In order to look at the comparisons between economies made within newspapers, we also looked at the number of times other economies were mentioned in an article. In order to not include the repeating of league tables that included several results, only those articles that mentioned an economy more than 3 times were included. Table 3 shows that generally newspaper articles reported on the country they were published in, but that some economies also report on higher-scoring economies (e.g. Singapore) or on particular differential performance within their own countries (e.g. nations of the UK). The news provision in the UK was the most diverse, possibly a result of the large number of newspaper articles identified.

Table 2. Extent of PISA 2022 newspaper and social media presence.

	Newspaper corpus		Social media corpus		
UNITEMS	NIWORDS	TWEETS	TWORDS	TVIEWS	
AUS	57	19,231	15	271	8,291
BRN	–	–	3	51	433
CAN	27	9,832	16	339	18,122
HKG	5	2,304	2	55	1,869
IRL	5	1,782	9	205	16,194
MLT	2	687	–	–	–
NZL	18	7,274	4	59	1,528
PHL	68	22,677	79	1,319	1,776,314
SGP	11	3,915	4	80	496
UEA	–	–	10	183	67,885
UK	183	64,210	139	1,886	695,727
USA	4	1,849	11	196	2,260

Note: AUS = Australia, BRN = Brunei, CAN = Canada, HKG = Hong Kong, IRL = Ireland, MLT = Malta, NZL = New Zealand, PHL = The Philippines, SGP = Singapore, UEA = United Arab Emirates, UK = United Kingdom of Great Britain and Northern Ireland, USA = United States of America, UNITEMS = Unique news items, NIWORDS = Total number of news item words, TWEETS = Number of tweets on social media platform X, TWORDS = Total number of words in tweets, TVIEWS = Total number of views for tweets. All numbers pertain to the data collection window of November 5th, 2023 to January 5th, 2024. The symbol "–" indicates that no sources were found for that cell.

Table 3. Newspaper mentions of other economies.

Newspaper article origin	Economies mentioned
Australia	Australia (35 articles), Singapore (8 articles), UK (1 article)
Canada	Canada (11 articles)
Hong Kong	Hong Kong (3 articles)
Ireland	Ireland (4 articles), Singapore (1 article)
Malta	Malta (2 articles)
New Zealand	New Zealand (7 articles)
The Philippines	The Philippines (50 articles), Singapore (1 article)
Singapore	Singapore (7 articles), UK (3 articles)
United Kingdom	Scotland (197 articles), UK (106 articles), England (91 articles), Wales (39 articles), Singapore (9 articles), Australia (7 articles), Ireland (7 articles), Canada (2 articles), Hong Kong (2 articles), New Zealand (1 article)
USA	USA (3 articles), Singapore (2 articles)

Sentiment analysis of our three corpora

We compared the messaging for our three corpora, government, newspapers and social media using sentiment analysis, with average sentiment scores presented in Table 4. Government documents were generally positive with all economies' government documents recording positive average sentiments, and the average sentiment surpassing that of news items, except for Ireland. Newspaper items in Australia, Canada, Hong Kong, New Zealand and the United Kingdom were negative on average, with Singapore and Ireland the most positive average sentiments in their newspaper corpus. Sentiments for social media were on average negative for Australia, Canada, The Philippines and United Kingdom. For the other economies, social media sentiments were positive. Looking across sentiment scores a few economies had positive profiles with positive average sentiment scores across the three corpora (Brunei Darussalam, Ireland, Malta, Singapore, United Arab Emirates, and USA). Three economies had positive government signalling, but negative newspaper and social media presence (Australia, Canada, Hong Kong and United Kingdom). Finally, the Philippines and New Zealand showed mixed messaging in print media and social media.

Table 4. Average sentiment scores for government, newspaper and social media corpora. More green = more positive, more red = more negative.

	Average sentiment value		
	Government	Newspapers	Social media
AUS	0.75	−0.16	−0.43
BRN	1.06	–	2.00
CAN	1.64	−0.26	−0.67
CAN-PEI	2.00	–	–
HKG	1.47	−0.24	–
IRL	0.87	0.90	1.71
MLT	1.25	0.68	–
NZL	0.29	−0.15	0.14
PHL	1.00	0.08	−0.38
SGP	1.27	0.94	2.00
UEA	2.67	–	1.88
UK	–	−0.25	−0.48
UK-EN	1.62	–	–
UK-SCO	1.50	–	–
UK-WAL	0.73	–	–
UK-NI	0.88	–	–
USA	1.07	0.26	0.64

Note: AUS = Australia, BRN = Brunei, CAN = Canada, CAN-PEI = Prince Edward Island, HKG = Hong Kong, IRL = Ireland, MLT = Malta, NZL = New Zealand, PHL = The Philippines, SGP = Singapore, UEA = United Arab Emirates, UK = United Kingdom of Great Britain and Northern Ireland, UK-EN = England, UK-SCO = Scotland, UK-WAL = Wales, UK-NI = Northern Ireland, USA = United States of America. All numbers pertain to the data collection window of 5th November 2023 to 5th January 2024. The symbol "–" indicates that no sources were found for that cell.

An analysis of the correlations between average sentiment for the three corpora and mathematics performance in PISA 2022 showed no significant correlations, except a very strong correlation between average sentiments in newspapers and social media (Spearman's $\rho = .976$, $p < .001$).

Content analysis of our three corpora

The OECD reporting of PISA 2022 results focused on the overall decline in performance in reading, mathematics and science with the headline "Amidst unprecedented performance drop, some education systems buck the trend" (OECD, 2023c), despite the fact that the decline in science was not statistically significant. Its webinar launch presented by Andreas Schleicher began with a brief description of the mathematics framework before emphasising the changing demands of mathematical literacy since 2003, leading to the reporting of the overall decline in mathematics performance. The headline for the section that focused on socioeconomic and gender differences in mathematics performance was "Supporting students in and beyond the classroom is key", which did not include the terms equity or mathematics. Equity was later phrased in terms of "poverty need not be destiny" (OECD, 2023a).

Almost all governments paid attention to the PISA 2022 results, with many economies producing their own national reports on the same day as the OECD publication, as well

as through planned print and social media contributions. The majority of newspaper articles focused on the reporting of the overall results in mathematics, reading and science, often including descriptions of rankings (despite this being widely critiqued by academics as statistically dubious). Only 10 articles focused specifically on mathematics, 6 from Canada, 3 from the USA and 1 from the UK. The articles from Canada and the USA were reactions to "disturbing" or "plummeting" national performance, while the article from the UK attributed performance to the impact of their mathematics reforms (authored by one of the key ministers involved in these reforms). In contrast, there were 12 articles focused on reading (8 from the Philippines, 3 from Canada and 1 from Australia), and 4 focused on science (3 from the UK: Scotland and 1 from Ireland). A few articles, largely in Scotland, used PISA as a justification for recently announced policies rather than focusing on PISA directly. Interestingly, despite similar results in the three subject areas and mathematics being the major domain in 2022, the newspaper articles focusing on education reform focused almost exclusively on reading, reflecting recent reform announcements in the weeks leading up to the PISA results announcement.

Several of the Anglophone countries that we focused on have state or regional-level education systems, which are reported separately in some cases. These countries include Australia, Canada, the USA, and the United Kingdom. In Canada and the UK media attention varied between states or nations. Within the UK comparisons were frequently made between the different nations, as shown in Table 3. These comparisons possibly reflected the politicised nature of participation within the UK, with different political parties holding responsibility and education policy devolved to each of the nations. Many of the newspaper articles within England either celebrated England's performance or criticised performance in Scotland (or both). This reflected the focus on ranking within many of these articles where the "rank" of England was higher than in previous cycles, despite the lower average scores and potential bias in the sample. These caveats were discussed in social media by journalists, policy advisors and academics, but not largely in newspapers. There was limited focus in the social media items on mathematics specifically (for some examples see Figure 1). Just 121 social media items included mathematics explicitly in their text, with 35 of these focusing specifically on mathematics rather than reporting results relating to mathematics, reading and/or science. Fourteen

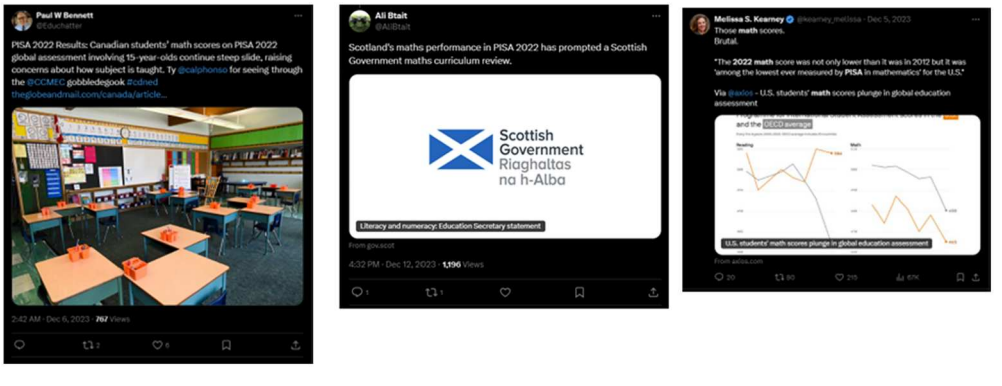

Figure 1. Examples of social media posts focused solely on mathematics.

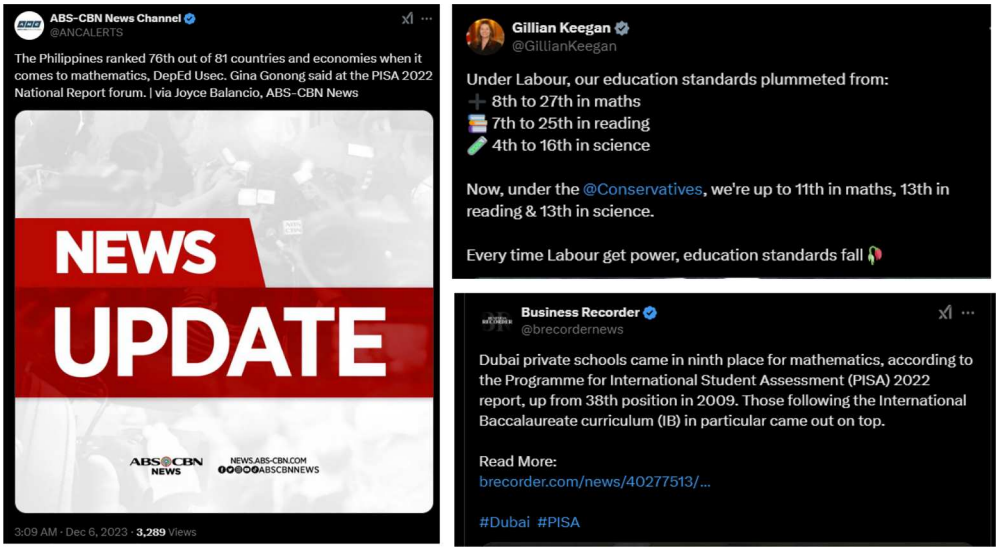

Figure 2. Examples of social media items mentioning rankings.

tweets focused on a newspaper article with the headline "Rise in maths, but warning over inflated results".

Only 31 social media items mentioned ranking which related specifically to mathematics performance, with some examples presented in Figure 2. The Philippines had the most social media items discussing ranks, largely in response to the low performance of its students. There were also social media or newspaper items authored by government representatives in England, Ireland, Singapore, and Hong Kong that focused on rankings, but most social media items focused on the scores and changes in scores. OECD still published country rankings, but these were not encouraged in their main reporting where the emphasis was on statistical significance. As statements on mathematics were limited, we conducted two additional content analyses, one focussed on a wider set of relevant keywords (KWIC analysis) from the newspaper corpus, and one focussing on the records of UK Parliamentary discussions (Hansard).

UK mathematics in context

In this section, we focus only on the parts of the corpora from the UK. Of the 64,210 words (see Table 1) in all UK newspaper items, there were 693 occurrences of words beginning with math (KWIC "math*"). Mathematics was often discussed as one of the three achievement outcomes in PISA 2022. Comparisons with other economies were often made. The terms top- or high-performing occurred more than a dozen times, and there were ample comparisons with other economies (Singapore 57 times, Shanghai and China 30 times, Estonia 46 times, Japan 39 times, Korea 29 times). In some cases, this referred to the past where, for example, Finland (13 times) was seen as a benchmark. More often direct comparisons were made.

> the UK has climbed the rankings in **maths** to joint 12th, alongside Belgium, Denmark
> (London Evening Standard)
> leading Pisa ranking countries such as Singapore and **China**
> (The Scotsman)

It is notable that some news items referred to China, given that China has never participated as a complete country. Results for mathematics in the UK also often differentiated between the home nations, seldomly making comparisons between these and other countries.

> The reduction here has been most severe in **maths**, where our score has decline by 18 points
> (The Herald, Scotland)
> but Scottish results were lower than England in **maths** and science for both groups
> (The Scotsman)

Policy-relevant terminology was used in the newspaper articles; the term "curriculum" appeared 242 times. Here, again the distinction between UK nations was apparent. One focus was Scotland's Curriculum for Excellence (CfE), which was introduced in 2010–2011, with some sources referring to it as a:

> modern, forward-thinking **curriculum** to equip children with the skills they need
> (The Times)

with a renewed emphasis in policy on the role of the teacher as an active developer of the curriculum, while others criticised it for being vague, lacking structure, and downplaying knowledge. The CfE was also linked to Scotland's long-term decline in PISA outcomes, with some media reporting the results as a "national disgrace", and political leaders demanding accountability and reform. At the same time, England's performance "improved" in global rankings. Almost none of the newspapers reported on the possible causes of the improvements, except for an article authored by the former Schools Minister, Nick Gibb, who attributed it to the introduction of a structured curriculum with a knowledge-rich approach, mentioning Singapore, Shanghai and Maths Hubs as important levers in mathematics education policy. The corpus also included an interview with Gibb, where he mentioned several of our search terms, for example the emphasis on south-east Asian mathematics teaching methods in primary schools. Another article written by the former Secretary of State for Education, Gillian Keegan, also referred to Asian-style "Teaching for maths mastery" (The Scotsman). Both examples showed how government and media sources in the UK were intertwined. Finally, we also saw other common themes in the context of mathematics education. For example, gender gaps (with boys outperforming girls) and socioeconomic gaps in mathematics performance were also significant across all UK nations. Arguing that one UK nation outperformed another in PISA mathematics, did not account for the socio-economic factors that correlated with performance. Some outlets, like the Telegraph, reported how "Covid wiped out improvements in maths and reading in the UK but not in some other countries". Finally, some media sources mentioned other findings in the OECD reports, for example:

> The UK nations – along with Canada, Denmark, Finland, Hong Kong China, Ireland, Japan, Korea, Latvia, and Macao China – are "highly equitable" according to Pisa definition
> (Wales Online)

Another major area of PISA engagement was found in the UK parliament. Records of UK Parliamentary discussions showed a complex relationship between PISA and policies in England. The records also showed changes in focus of interest. Before PISA 2022, PISA results were used to justify a need for curriculum reform in England (e.g. Gibb, 2015, January 22; Gove, 2010, December 7; Hansard, 2013, December 3). Higher performing economies were named as a model for the then-proposed reform, which focused on improving academic achievements, including in mathematics (e.g. Gove, 2013, December 3; Hansard, 2013, December 3). The improvement in PISA results in mathematics was also attributed to specific interventions (e.g. Maths Hubs, Teaching for Mastery). In addition, the parliamentary discussions included PISA 2022 data on pupils' wellbeing (Hansard, 2025, May 20). The change in discourse topics appeared to be in line with how PISA has been reported by OECD and in media. PISA data have also motivated or justified initiatives in mathematics education, which have in turn generated evidence for policy discourses. For example, in their report of Mathematical Futures and Maths Horizons programmes, The Royal Society (2024) drew on reports on PISA data and recommended a reform of mathematical and data education. The reports of the programmes were then discussed at the Lords Science and Technology Committee (UK Parliament, 2025, May 21).

To summarise, the analysis of newspaper combined with parliamentary discussions in the UK shows the role PISA 2022 played in UK education policy, and mathematics education in particular.

Discussion

In this study, we collected media items concerning PISA 2022 to analyse coverage in Anglophone countries. Our analysis has enabled an understanding of the extent of PISA engagement, the sentiments of the documents, and themes and topics of PISA 2022 coverage. Although most of the reactions report on PISA results in general, PISA 2022 has particular relevance for the mathematics education community given its focus on mathematics.

Over the 1-month period, there were 380 newspaper articles and 292 tweets about PISA 2022 published in the Anglophone countries (or, in total, 568 tweets written in English about "PISA 2022"). Compared to the finding of Baroutsis and Lingard (2021) that 17,260 tweets and re-tweets were written in English about PISA 2015 in the 3-day period between 5th and 7th December 2016, the much smaller number of tweets about PISA 2022 echoes Jerrim's (2024) finding that global attention to PISA seems to have declined. Despite the declining attention, different stakeholders have different voices. In line with previous research (e.g. Baroutsis & Lingard, 2017; Volante & Klinger, 2023; Volante & Mattei, 2024; Waldow et al., 2014), the data show that country mean scores and rankings captured most attention in the media; OECD and governments used PISA 2022 results for their own agendas and produced generally positive discourses to support their claims and political decisions, whereas the sentiments of the other sources were more diverse. We argue that individual and organisational agendas can be inferred from how countries' results are compared, for example, the choice of comparator countries and what PISA data are referred to. Historically, we have seen examples of this with previous cycles of PISA. For example, Finland has often been

used as example of a successful education system based on PISA results (Sahlberg, 2014), soliciting counter-reactions also based on PISA (Sahlgren, 2015). PISA 2012 mathematics data have been used to make claims about memorisation (Boaler, 2015). With PISA 2015, much attention was given to the negative association between inquiry-based science teaching and science achievement (Cairns & Areepattamannil, 2019). PISA 2018 data were also used to make the case for "knowledge" (Crato, 2021). These are not unreasonable analyses. However, with PISA firmly in the policy space, they are perhaps in danger of becoming "policy-based evidence" (Compton & Boylan, 2024), whereby the policy decisions go in search of evidence, rather than that policy decisions are based *on* evidence. The phenomenon also is not restricted to Anglophone contexts, as similar selective usage of PISA results by media and government was found, for example, in South Korea (e.g. Jang, 2024; Kim & Choi, 2025), where "the attitudes of the [South] Korean media towards PISA fluctuate based on national circumstances, when distinct educational agendas of equity and excellence are underscored as national objectives by ruling governments" (Jang, 2024, p. 601).

Aforementioned agendas can sometimes be different to PISA's assessment framework and focus. Although mathematics was the major domain in PISA 2022, and mathematical reasoning was made explicit as a process domain in the assessment for the first time, mathematical reasoning did not capture specific attention in the media or even in OECD's own messaging. In PISA 2012, there were working papers on process domains in mathematics (e.g. Stacey & Turner, 2015), but these are missing in PISA 2022. As it is unlikely that there will be another report on PISA 2022 specific to mathematics from OECD, we infer that the focus of PISA has drifted away from the subjects. In contrast, OECD pays more attention to equity in education, or innovative domains such as learners' creative and financial skills, and their learning motivation. We note that despite the OECD not providing more in-depth analyses of the PISA 2022 mathematics data, there still is a wealth of information in the actual dataset, including data on mathematics anxiety, cognitive activation in mathematics, and parent attitudes toward mathematics. For the mathematics education research community, it could be useful that such data are independently studied. Likewise, we observed that our sample governments did not pay much attention to specific process or content domains in mathematics neither. For example, in their consultation documents and media blog, the England government focused mainly on country mean scores and rankings and used them to make political arguments (Department for Education, 2023; GOV.UK, 2024), rather than looking into specific mathematical domains in PISA results.

We also observed that compared to other voices, the voices from academics appear to be fewer. Partly, this might be caused by the way OECD organises its studies, with national centres often administering and analysing data, performing contract work for OECD. Outside of these centres there often are limited skills and knowledge to conduct analyses with the complex sampling design of such studies. We also realise that academic voices on PISA data are affected by peer review and publication process. Academic voices should hold balanced views and make claims based on research; given that nowadays academic publication process can take months and years, it is expected that academics' opinions on PISA data are not often being heard in the months after the first publication of PISA data. Moreover, voices, such as critique on validity of PISA data (e.g. Jerrim & Zieger, 2023; Rutkowski & Rutkowski, 2013), and

OECD's responses, often, do not catch much attention from media, for example in newspaper's headlines.

We aimed to investigate how PISA 2022 mathematics results have influenced policy-making in Anglophone countries by analysing the quantity, sentiments and content of media presentations and discussions in the months surrounding the public release of the results. In New Zealand and Scotland newspaper reports included calls for curricular reform in mathematics following declining performance in PISA 2022. In contrast, in England the results were used to justify the reforms made since the previous cycle. In Australia and Scotland there were also calls for policy reforms unrelated to mathematics, such as the banning of mobile phones in schools or in response to the reports of bullying in the PISA reports. For example, some commentators see no problem with using PISA's correlational data to state causal links with particular pedagogical approaches, even when PISA does not measure this. If achievement disappoints, this often is a sign for advocacy groups to argue for their preferred mathematics education approaches, as they will surely improve things. And if an economy then adopts such practices, but achievement still disappoints, there surely must have been other variables that frustrated a good implementation. We also must realise that OECD has its agenda as well, with an ever-changing focus on themes that are seen to be popular, for example financial literacy in the PISA 2022 round. In this interplay of policy makers and educational institutions it can be hard to separate the wheat from the chaff. It is our view that rigorous mathematics education research can help this separation.

Having said that, we acknowledge the limitations of this study. Firstly, we were surprised that the total number of sources fluctuated a lot, and, overall, seemed quite limited. Although we think this can partly be attributed to a decline in PISA interest, it meant that we could only build part of the picture. Numerous sources were in the Spanish language and these were not included. However, given our focus on English-speaking economies, we estimated this did not pose a problem. We observed that search engines did not always classify countries correctly. This especially seemed to be the case for the USA, with many of the sources attributing articles about other economies to the USA (in the case of web searches) or not attributing many articles to the USA at all (Lexis Nexis). This likely spoke to the fact that a global community essentially can write about every country *in* every country. Claims regarding countries were also complicated by the fact that sub-regions might have different education policies, like nations in the UK or US states. In our analysis, we chose to first focus on the entities included in PISA 2022, and only in the deeper analyses to include thoughts about such areas. Although we think it is most likely for a specific PISA round that government and media attention *follow* the publication of PISA results, there will be much policy activity and some media attention between PISA rounds, which of course in term can influence PISA achievement. Essentially, policy enactment often is a continuous process. Finally, although our sentiment measure gave insights in the tone and sentiment of our sources, it would have struggled with sarcasm and double negations, as the algorithm considers text as a "bag of words" which together formed a sentiment score. Furthermore, to compare sentiments, we used the same approach for all three corpora, but our sentiment measure was optimised for social media. A surprising result was the enormous drop in social media engagement with the PISA results from Baroutsis and Lingard (2021). One reason for this might have been the different data collection method, using

an intermediary (dnoise), while we collected data directly from the Twitter/X website. However, the change in ownership of, and algorithms used in, Twitter/X could directly have led to different search results. Furthermore, an indirect effect of both might have been that the userbase for education content moved to other platforms, tweeted less or were less visible to other users. Nevertheless, the reduction in activity did comport with recent research by Jerrim (2024).

So, what could our findings mean for how academics and wider society in the UK or abroad should navigate a policy and media landscape that is influenced by PISA? Academic views appear to be limited in our findings: while this might highlight a need for academics to make more use of social media and become more vocal and strategic (e.g. Lange & Meaney, 2018), it also highlights the different standards of rigour in relation to the use of evidence that academics are held to, and the different timelines to which they work. Academics can make their research more visible to politicians and the public, though, through working together with the media to facilitate public debates but also to be more aware of the potential influences of public debate on academic discourses (e.g. Besley & Nisbet, 2011; Wagenknecht, 2012). Stakeholders in countries' education systems, from teachers to students, from parents to researchers and organisations like the OECD, all have their own interests, sometimes overlapping, but sometimes conflicting. Results of ILSAs should not be the end-point of discussion, but the starting point of discussion, where we consider the views of all those stakeholders. This requires initial restraint in positing strong causal conclusions regarding what needs to happen with a country's education based on ILSA result. Rather, we need to organise a broad conversation between the different stakeholders, including those views that don't immediately correspond with stakeholders' own views. We might sometimes disagree with each others, but we first need to transparently know what we all would like mathematics education to look like. Regardless of policy machinations, we are likely united in an aim provide the best mathematics education possible.

Conclusion

In this article, we analysed three sources of policy reactions in relation to PISA 2022 results, from governments, mainstream media and social media, focusing on the extent of the reactions, the sentiment of the reactions, and the themes of PISA 2022 mathematics coverage. Given the populations in English speaking economies the extent of coverage from all sources was limited. This might confirm Jerrim's conclusion that "peak PISA" might have passed (Jerrim, 2024). Sentiment analysis showed that government documents were more positive about PISA 2022 than newspapers and social media. However, there were differences between economies. Although PISA 2022 specifically focused on mathematics, most responses pertained to the headline figures for all three subjects. Relatively limited attention was given to the focus of PISA 2022 of mathematics. Further analyses of mathematics-specific statements in the corpora showed that statements remained very broad, except when they served as justification of policy choices by governments, as shown for the case of the UK. This further underlined the continuing role of media in PISA 2022 mathematics education policymaking in Anglophone countries.

Notes

1. For example, the USA has state-level policies, and the United Kingdom has devolved educational policy towards England, Wales, Scotland and Northern Ireland.
2. We also used Gale search and Press reader, but these did not yield more newspaper items.
3. We used keywords math*, math, maths, mathematics, mastery, high-performing, top-performing, knowledge-rich, curriculum, curricula, Finland, Singapore, England, Shanghai, China, Estonia, Japan, Korea.
4. One thousand two hundred twenty-nine words if the notes were excluded. The notes included a reprinting of part of the performance tables from the OECD report and part of the executive summary of the national report.

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References

Addey, C., Sellar, S., Steiner-Khamsi, G., Lingard, B., & Verger, A. (2017). The rise of international large-scale assessments and rationales for participation. *Compare: A Journal of Comparative and International Education*, *47*(3), 434–452. https://doi.org/10.1080/03057925.2017.1301399

Andrews, P., Atkinson, L., Ball, S. J., Barber, M., Beckett, L., Berardi, J., Berliner, D., Bloom, E., Boudet, D., Boland, N., Burris, C. C., Cauthen, N., Cerrone, C., Ciaran, S., Deutermann, J., Devine, N., Dodge, A., Dodge, J., Farley, T., … Zhao, Y. (2014, May 6). OECD and Pisa tests are damaging education worldwide – Academics. *The Guardian*. https://www.theguardian.com/education/2014/may/06/oecd-pisa-tests-damaging-education-academics

Baird, J.-A., Isaacs, T., Johnson, S., Stobart, G., Yu, G., Sprague, T., & Daugherty, R. (2011). *Policy effects of PISA*. Pearson UK. https://ora.ox.ac.uk/objects/uuid:26c9fccd-ae47-424e-ba40-0c84ebedfc3e/files/m3781c5020f1ce13427a6bed35d8b7c6d

Baird, J.-A., Johnson, S., Hopfenbeck, T. N., Isaacs, T., Sprague, T., Stobart, G., & Yu, G. (2016). On the supranational spell of PISA in policy. *Educational Research*, *58*(2), 121–138. https://doi.org/10.1080/00131881.2016.1165410

Baroutsis, A., & Lingard, B. (2017). Counting and comparing school performance: An analysis of media coverage of PISA in Australia, 2000–2014. *Journal of Education Policy*, *32*(4), 432–449. https://doi.org/10.1080/02680939.2016.1252856

Baroutsis, A., & Lingard, B. (2021). A methodological approach to the analysis of PISA microblogs: Social media during the release of the PISA 2015 results. *Journal of Education Policy*, *37*(6), 904–924. https://doi.org/10.1080/02680939.2021.1937706

Barwell, R., & Abtahi, Y. (2019). Mathematics education in the news: Introduction. *Canadian Journal of Science, Mathematics and Technology Education*, *19*(1), 1–7. https://doi.org/10.1007/s42330-019-00043-z

Besley, J. C., & Nisbet, M. (2011). How scientists view the public, the media and the political process. *Public Understanding of Science*, *22*(6), 644–659. https://doi.org/10.1177/0963662511418743

Boaler, J. (2015). *The elephant in the classroom: Helping children learn and love maths*. Souvenir Press.

Bokhove, C., Miyazaki, M., Komatsu, K., Chino, K., Leung, A., & Mok, I. A. C. (2019). The role of "opportunity to learn" in the geometry curriculum: A multilevel comparison of Six countries. *Frontiers in Education*, *4*, 63. https://doi.org/10.3389/feduc.2019.00063

Burkhardt, H. (2014). Curriculum design and systemic change. In Y. Li & G. Lappan (Eds.), *Mathematics curriculum in school education* (pp. 13–34). Springer. https://doi.org/10.1007/978-94-007-7560-2_2

Cairns, D., & Areepattamannil, S. (2019). Exploring the relations of inquiry-based teaching to science achievement and dispositions in 54 countries. *Research in Science Education*, *49*(1), 1–23. https://doi.org/10.1007/s11165-017-9639-x

Carnoy, M., Khavenson, T., Loyalka, P., Schmidt, W. H., & Zakharov, A. (2016). Revisiting the relationship between international assessment outcomes and educational production: Evidence from a longitudinal PISA-TIMSS sample. *American Educational Research Journal*, *53*(4), 1054–1085. https://doi.org/10.3102/0002831216653180

Chorney, S., Ng, Q.-L., & Pimm, D. (2016). A tale of two more metaphors: Storylines about mathematics education in Canadian national media. *Canadian Journal of Science, Mathematics and Technology Education*, *16*(49), 402–418. https://doi.org/10.1080/14926156.2016.1235746

Compton, A., & Boylan, M. (2024). Policy-based evidence? The schools inspectorate in England, research and school mathematics policy. *Research in Mathematics Education*, 1–22. https://doi.org/10.1080/14794802.2024.2418082

Crato, N. (2021). *Improving a country's education: PISA 2018 results in 10 countries* (p. 263). Springer Nature. https://doi.org/10.1007/978-3-030-59031-4

Crome, J. (2022). Panic and stoicism: Media, PISA and the construction of truth. *Policy Futures in Education*, *20*(7), 828–839. https://doi.org/10.1177/14782103211064660

Davis, E. R., Wilson, R., & Dalton, B. (2018). Another slice of PISA: An interrogation of educational cross-national attraction in Australia, Finland, Japan and South Korea. *Compare: A Journal of Comparative and International Education*, *50*(3), 309–331. https://doi.org/10.1080/03057925.2018.1510305

De Lange, J. (2007). Large-scale assessment and mathematics education. In F. K. J. Lester (Ed.), *Second handbook of research on mathematics teaching* (Vol. 2, pp. 1111–1142). Information Age Publishing.

Department for Education. (2010). The importance of teaching: The schools white paper 2010. https://www.gov.uk/government/publications/the-importance-of-teaching-the-schools-white-paper-2010

Department for Education. (2023). *A world-class education system: The Advanced British Standard consultation* (CP991). https://consult.education.gov.uk/advanced-british-standards-directorate/the-advanced-british-standard/

Ertl, H. (2006). Educational standards and the changing discourse on education: The reception and consequences of the PISA study in Germany. *Oxford Review of Education*, *32*(5), 619–634. https://doi.org/10.1080/03054980600976320

Gibb, N. (2015, January 22). *Nick Gibb: Reforming education through international evidence*. Department for Education. https://www.gov.uk/government/speeches/nick-gibb-reforming-education-through-international-evidence

Giberti, C., & Maffia, A. (2020). Mathematics educators are speaking about PISA, aren't they? *Teaching Mathematics and its Applications*, *39*(4), 266–280. https://doi.org/10.1093/teamat/hrz018

Gove, M. (2010, December 7). *Major international study shows England's 15-year-olds performing poorly in mathematics, science and reading*. Department for Education. https://www.gov.uk/government/news/major-international-study-shows-englands-15-year-olds-performing-poorly-in-mathematics-science-and-reading

Gove, M. (2011). Michael Gove speaks to the Royal Society on maths and science. https://www.gov.uk/government/speeches/michael-gove-speaks-to-the-royal-society-on-maths-and-science

Gove, M. (2013, December 3). 2012 *OECD PISA results*. Department for Education. https://www.gov.uk/government/speeches/2012-oecd-pisa-results

GOV.UK. (2024). What is PISA data and how does it measure students' success at school [online blog]. https://educationhub.blog.gov.uk/2024/09/what-is-pisa-data-and-how-does-it-measure-students-success-at-school/

Green Saraisky, N. (2019). PISA rhetoric and the "crisis" of American education. In F. Waldow & G. Steiner-Khamsi (Eds.), *Understanding PISA's attractiveness: Critical analyses in comparative policy studies* (pp. 109–134). Bloomsbury Academic. https://doi.org/10.5040/9781350057319

Grey, S., & Morris, P. (2018). PISA: Multiple 'truths' and mediatised global governance. *Comparative Education*, *54*(2), 109–131. https://doi.org/10.1080/03050068.2018.1425243

Hamilton, M. (2017). How international large-scale skills assessments engage with national actors: Mobilising networks through policy, media and public knowledge. *Critical Studies in Education*, *58*(3), 280–294. https://doi.org/10.1080/17508487.2017.1330761

Hansard. (2013, December 3). *PISA results* [Hansard]. (Vol. 571). https://hansard.parliament.uk/commons/2013-12-03/debates/13120350000001/PISAResults

Hansard. (2025, May 20). *Children's wellbeing and schools bill* [Hansard]. (Vol. 846). https://hansard.parliament.uk/Lords/2025-05-20/debates/EF4E8290-86EC-40E9-8CFB-89AE4CFF848D/Children%E2%80%99SWellbeingAndSchoolsBill

Hu, X., Leung, F. K. S., & Teng, Y. (2018). The influence of culture on students' mathematics achievement across 51 countries. *International Journal of Science and Mathematics Education*, *16*(S1), S7–S24. https://doi.org/10.1007/s10763-018-9899-6

Ingram, J., Lee, G., & Stiff, J. (2024). Mathematical reasoning and problem-solving in PISA 2022 – How do performance profiles vary across countries? Proceedings of the 47th Conference of the International Group for the Psychology of Mathematics Education, Auckland, New Zealand.

Ingram, J., Lindorff, A., McCann, E., Riggall, A., & Sani, N. (2020). *TALIS Video Study National Report*. https://assets.publishing.service.gov.uk/media/6171952de90e071976488fd1/TVS_England_summary_report_for_Schools.pdf

Ingram, J., Stiff, J., Cadwallader, S., Lee, G., & Kayton, H. (2023). *PISA 2022: National Report for England*. https://assets.publishing.service.gov.uk/media/656dc3321104cf0013fa742f/PISA_2022_England_National_Report.pdf

Ingram, J., Stiff, J., & Lee, G. (submitted). Space for improvement: relative performance in different mathematics content areas in international large-scale assessments.

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*(4), 599–609. https://doi.org/10.1007/s11858-015-0691-6

Jang, S. (2024). Politics of PISA in educational agenda-setting: An analysis of the media coverage of PISA 2000-2018 in South Korea. *Oxford Review of Education*, *50*(4), 588–606. https://doi.org/10.1080/03054985.2023.2259794

Jerrim, J. (2015). Why do east Asian children perform so well in PISA? An investigation of western-born children of east Asian descent. *Oxford Review of Education*, *41*(3), 310–333. https://doi.org/10.1080/03054985.2015.1028525

Jerrim, J. (2024). Has peak PISA passed? An investigation of interest in international large-scale assessments across countries and over time. *European Educational Research Journal*, *23*(3), 450–476. https://doi.org/10.1177/14749041231151793

Jerrim, J., & Zieger, L. (2023). How robust are socio-economic achievement gradients using PISA data? A case study from Germany. *British Educational Research Journal*, *50*(1), 438–453. https://doi.org/10.1002/berj.3934

Kanes, C., Morgan, C., & Tsatsaroni, A. (2014). The PISA mathematics regime: Knowledge structures and practices of the self. *Educational Studies in Mathematics*, *87*(2), 145–165. https://doi.org/10.1007/s10649-014-9542-6

Kilpatrick, J. (2023). School mathematics: A bipolar subject. In Y. Shimizu & R. Vithal (Eds.), *Mathematics curriculum reforms around the world* (pp. 23–35). Springer. https://doi.org/10.1007/978-3-031-13548-4_2

Kim, Y., & Choi, T.-H. (2025). The influence of the programme for international student assessment on educational governance situated in the institutional setting of South Korea. *Policy Futures in Education*, *23*(1), 31–47. https://doi.org/10.1177/14782103231192741

Komatsu, H., & Rappleye, J. (2021). Rearticulating PISA. *Globalisation, Societies and Education*, *19*(2), 245–258. https://doi.org/10.1080/14767724.2021.1878014

Lange, T., & Meaney, T. (2018). Policy production through the media: The case of more mathematics in early childhood education. In M. Jurdak & R. Vithal (Eds.), *Sociopolitical dimensions of mathematics education. ICME-13 monographs* (pp. 191–207). Springer. https://doi.org/10.1007/978-3-319-72610-6_11

Lew, H.-c., Cho, W.-y., Koh, Y., Koh, H. K., & Paek, J. (2012). New challenges in the 2011 revised middle school curriculum of South Korea: Mathematical process and mathematical attitude. *ZDM Mathematics Education*, *44*(2), 109–119. https://doi.org/10.1007/s11858-012-0392-3

Lewis, S., & Lingard, B. (2022). PISA for sale? Creating profitable policy spaces through the OECD's PISA for schools. In C. Lubienski, M. Yemini, & C. Maxwell (Eds.), *The rise of external actors in education* (pp. 91–112). Bristol University Press. https://doi.org/10.51952/9781447359029.ch005

Liu, J. (2018). Government, media, and citizens: Understanding engagement with PISA in China (2009–2015). *Oxford Review of Education*, *45*(3), 315–332. https://doi.org/10.1080/03054985.2018.1518832

Lundahl, C., & Serder, M. (2020). Is PISA more important to school reforms than educational research? The selective use of authoritative references in media and in parliamentary debates. *Nordic Journal of Studies in Educational Policy*, *6*(3), 193–206. doi:10.1080/20020317.2020.1831306

Lundby, K. (2009). *Mediatization: Concept, changes, consequences*. Peter Lang Verlag.

Manning, C., & Schutze, H. (1999). *Foundations of statistical natural language processing*. MIT press.

Martens, K., & Niemann, D. (2010). *Governance by comparison: How ratings & rankings impact national policy-making in education* (TranState Working Papers, Issue. C. R. C.-T. o. t. S. Universität Bremen.

Meyer, H.-D., & Schiller, K. (2013). Gauging the role of non-educational effects in large-scale assessments: Socio-economics, culture and PISA outcomes. In H.-D. Meyer & A. Benavot (Eds.), *PISA, power, and policy: The emergence of global educational governance* (pp. 207–224). Symposium books.

Nielsen, FÅ. (2011). A new ANEW: Evaluation of a word list for sentiment analysis in microblogs. In: Proceedings of the ESWC2011 Workshop on 'making Sense of Microposts': Big Things Come in Small Packages.

Niss, M. (2015). Mathematical competencies and PISA. In K. Stacey & R. Turner (Eds.), *Assessing mathematical literacy – The PISA experience* (pp. 35–55). Springer. https://doi.org/10.1007/978-3-319-10121-7_2

Nortvedt, G. A. (2018). Policy impact of PISA on mathematics education: The case of Norway. *European Journal of Psychology of Education*, *33*(3), 427–444. https://doi.org/10.1007/s10212-018-0378-9

OECD. (2023a). *Launch of PISA 2022 results*. https://video.oecd.org/64dcc9ae1ba4df208be4ffbdfd056883/en/Launch-of-PISA-2022-Results.html

OECD. (2023b). *PISA 2022 Assessment and Analytical Framework*. https://doi.org/10.1787/dfe0bf9c-en.

OECD. (2023c). *PISA 2022 Results (Volume I): The state of learning and equity in education*. https://doi.org/10.1787/53f23881-en

OECD. (2024). *Programme for International Student Assessment (PISA)*. Retrieved December 7, 2024, from https://www.oecd.org/en/about/programmes/pisa.html

Pons, X. (2011). What Do We really learn from PISA? The sociology of its reception in three European countries (2001–2008). *European Journal of Education*, *46*(4), 540–548. https://doi.org/10.1111/j.1465-3435.2011.01499.x

Pons, X. (2017). Fifteen years of research on PISA effects on education governance: A critical review. *European Journal of Education*, *52*(2), 131–144. https://doi.org/10.1111/ejed.12213

R Core Team. (2021). R: A language and environment for statistical computing. https://www.r-project.org/

Rodney, S., Rouleau, A., & Sinclair, N. (2016). A tale of two metaphors: Storylines about mathematics education in Canadian national media. *Canadian Journal of Science, Mathematics and Technology Education*, *16*(49), 389–401. https://doi.org/10.1080/14926156.2016.1235746

R Studio Team. (2021). RStudio: Integrated Development for R. RStudio. https://posit.co/download/rstudio-desktop/

Rubel, L. H., & McCloskey, A. V. (2021). Contextualization of mathematics: Which and whose world? *Educational Studies in Mathematics*, *107*(2), 383–404. https://doi.org/10.1007/s10649-021-10041-4

Rutkowski, D., & Rutkowski, L. (2013). Measuring socioeconomic background in PISA: One size might not fit all. *Research in Comparative and International Education*, *8*(3), 259–278. https://doi.org/10.2304/rcie.2013.8.3.259

Rutkowski, D. J. (2007). Converging us softly: How intergovernmental organizations promote neoliberal educational policy. *Critical Studies in Education*, *48*(2), 229–247. https://doi.org/10.1080/17508480701494259

Sahlberg, P. (2014). *Finnish lessons 2.0: What can the world learn from educational change in Finland?* Teachers College Press.

Sahlgren, G. H. (2015). *Real Finnish lessons. The true story of an education superpower*. Centre for Policy Studies. https://cps.org.uk/wp-content/uploads/2021/07/150410115444-RealFinnishLessonsFULLDRAFTCOVER.pdf

Schleicher, A., & Zoido, P. (2016). The policies that shaped PISA, and the policies that PISA shaped. In K. Mundy, A. Green, B. Lingard, & A. Verger (Eds.), *Handbook of global education policy* (pp. 374–384). Wiley. https://doi.org/10.1002/9781118468005.ch20

Schmidt, W. H., Guo, S., & Houang, R. T. (2021). The role of opportunity to learn in ethnic inequality in mathematics. *Journal of Curriculum Studies*, *53*(5), 579–600. https://doi.org/10.1080/00220272.2020.1863475

Schmidt, W. H., Zoido, P., & Cogan, L. S. (2014). Schooling matters: Opportunity to learn in PISA 2012. In: *OECD Education Working Papers* (Vol. 95): OECD Publishing. https://doi.org/10.1787/5k3v0hldmchl-en

Seitzer, H., Niemann, D., & Martens, K. (2021). Placing PISA in perspective: The OECD's multicentric view on education. *Globalisation, Societies and Education*, *19*(2), 198–212. https://doi.org/10.1080/14767724.2021.1878017

Shimizu, Y., & Vithal, R. (2023). School mathematics curriculum reforms: Widespread practice but under-researched in mathematics education. In Y. Shimizu & R. Vithal (Eds.), *Mathematics curriculum reforms around the world* (pp. 3–21). Springer. https://doi.org/10.1007/978-3-031-13548-4_1

Sivesind, K., Nordin, A., & Ydesen, C. (2024). Instrument constituencies and the brokering of OECD-knowledge in Nordic school reforms – a three country comparison. *Nordic Journal of Studies in Educational Policy*, 1–18. https://doi.org/10.1080/20020317.2024.2419480

Smith, C., & Morgan, C. (2016). Curricular orientations to real-world contexts in mathematics. *The Curriculum Journal*, *27*(1), 24–45. https://doi.org/10.1080/09585176.2016.1139498

Stacey, K. (2015). The real world and the mathematical world. In K. Stacey & R. Turner (Eds.), *Assessing mathematical literacy – The PISA experience* (pp. 57–84). Springer. https://doi.org/10.1007/978-3-319-10121-7_3

Stacey, K. & Turner, R. (Eds.). (2015). *Assessing mathematical literacy – The PISA experience*. Springer. https://doi.org/10.1007/978-3-319-10121-7

Takayama, K. (2010). Politics of externalization in reflexive times: Reinventing Japanese education reform discourse through "Finnish PISA success". *Comparative Education Review*, *54*(1), 51–75. https://doi.org/10.1086/644838

The Royal Society. (2024). *A new approach to mathematical and data education*. https://royalsociety.org/-/media/policy/projects/maths-futures/mathematical-and-data-education-policy-report.pdf

Tsatsaroni, A., & Evans, J. (2013). Adult numeracy and the totally pedagogised society: PIAAC and other international surveys in the context of global educational policy on lifelong learning. *Educational Studies in Mathematics*, *87*(2), 167–186. https://doi.org/10.1007/s10649-013-9470-x

UK Parliament. (2025, May 21). *Swift intervention needed to address maths education crisis in UK, warn Lords Committee*. https://www.parliament.uk/business/lords/media-centre/house-of-lords-media-notices/2025/may-2025/swift-intervention-needed-to-address-maths-education-crisis-in-uk-warn-lords-committee/

Vasagar, J. (2011). Michael Gove's Maths curriculum reforms flawed, says numeracy charity. *The Guardian*. https://www.theguardian.com/education/2012/aug/13/michael-gove-maths-reforms-flawed-charity

Verger, A., Ferrer-Esteban, G., & Fontdevila, C. (2024). Not everything that moves must converge: Evidence from global policy and practice on performance-based accountability. In D. B. Edwards Jr, A. Verger, M. McKenzie, & K. Takayama (Eds.), *Researching global education policy: Diverse approaches to policy movement* (pp. 39–69). Policy Press. https://doi.org/10.56687/9781447368045-006

Volante, L., & Klinger, D. A. (2023). PISA, global reference societies, and policy borrowing: The promises and pitfalls of 'academic resilience'. *Policy Futures in Education*, *21*(7), 755–764. https://doi.org/10.1177/14782103211069002

Volante, L., & Mattei, P. (2024). The politicization of PISA in evidence-based policy discourses. *Policy Futures in Education*, *22*(8), 1554–1569. https://doi.org/10.1177/14782103241227309

Wagenknecht, S. (2012). Debating troy in the mass media – The catalytic impact of public controversy on academic discourse. In S. Rödder, M. Franzen, & P. Weingart (Eds.), *The sciences' media connection – public communication and its repercussions. Sociology of the sciences yearbook* (Vol. 28, pp. 291–306). Springer. https://doi.org/10.1007/978-94-007-2085-5_15

Waldow, F., Takayama, K., & Sung, Y.-K. (2014). Rethinking the pattern of external policy referencing: Media discourses over the 'Asian tigers'' PISA success in Australia, Germany and South Korea. *Comparative Education*, *50*(3), 302–321. https://doi.org/10.1080/03050068.2013.860704

Zhao, Y. (2020). Two decades of havoc: A synthesis of criticism against PISA. *Journal of Educational Change*, *21*(2), 245–266. https://doi.org/10.1007/s10833-019-09367-x