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Changes in media coverage of GCSEs from 1988 to 2017

Research Report

Matthew Carroll

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Author contact details:

Matthew Carroll
Assessment Research and Development,
Research Division
Cambridge Assessment
The Triangle Building
Shaftesbury Road
Cambridge
CB2 8EA
UK

carroll.m@cambridgeassessment.org.uk

http://www.cambridgeassessment.org.uk

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Acknowledgements

Summary

- The news media both reflects and influences public opinion, and can set the agenda for public discourse. High-stakes examinations are a major feature of education news coverage in the UK, so to understand the public discourse around exams it is important to examine how they are portrayed. Existing analyses have typically achieved this by analysing the content of newspaper articles. Automated text mining approaches permit a larger number of documents to be analysed than would be possible using traditional methods, so here, text mining methods were applied to a corpus of articles published about General Certificate of Secondary Education (GCSE) qualifications from 1988 (the year in which final GCSE exams were first sat) to the end of 2017 (following the first exams sat for reformed GCSEs).

- Articles from national newspapers and a specialist education publication were downloaded from the *LexisLibrary* database. Metadata and article text were extracted, duplicates were removed, and articles without "GCSE" in the headline or at least four times in the text were removed. This left 6,831 articles from 25 sources. Text was cleaned (i.e., removal of punctuation, most numbers, structural phrases, and commonly used but uninformative words), lemmatised (conversion of inflected words into the same form) and converted to lowercase. The final corpus contained over 2 million words.

- Simple analyses examined the most frequently used words. These typically related to exams and results (e.g., "exam", "result", "percent", and "grade"), whilst other highly used words indicated a focus on top grades (e.g., "Astar", representing the A* grade) and on core subjects (e.g., "English" and "maths"). There were limited differences between broadsheets and tabloids, but greater differences between the general press and the specialist press.

- Words were assigned 'positive' or 'negative' sentiments from a sentiment dictionary. The most frequent positive words related to high achievement and improvements (e.g., "top", "gain", and "improve"), whilst the most frequent negative words related to failure, declines, and problems (e.g., "fail", "fall", and "concern"). More words were assigned positive than negative sentiment, with 54 per cent of assigned words being positive. Absolute sentiment scores must be interpreted cautiously, with relative comparisons perhaps being more valid: the specialist press had the most positive sentiment scores, followed by broadsheets and then tabloids.

- Latent Dirichlet allocation was used to identify groups of words constituting topics. Fifty topics were modelled. The most common topic related to summaries of GCSE results; other common topics related to qualification reforms. Tabloids showed a greater focus on 'personal' topics, such as profiles of candidates, whilst the specialist press showed a greater focus on vocational qualifications. The topics with the most positive sentiment scores related to results, whilst the most negative related to the exam system and problems experienced by candidates.

- Analyses were repeated to examine variation over the 30 years covered by the corpus. Coverage increased substantially over time, with spikes every August coinciding with the release of results, as might be expected. The most common

words were broadly similar over time. There appeared to be an increasing focus on results and core subjects (e.g., English and maths), and increasing coverage of students relative to coverage of teachers. Language used in August results coverage dominated the overall corpus.

- Against expectations, net sentiment increased over time, from negative in the earliest years, up to a peak in the late 1990s, before declining again; the biggest drop in sentiment occurred in 2012 and appeared to be associated with a decline in GCSE English grades. Within years, positive sentiment peaks were associated with the release of results and league tables, probably reflecting coverage of high-achieving individuals and schools; the least positive sentiment occurred in May and June, coinciding with the main period in which exams are sat.

- Coverage in the first decade focused on introduction of GCSEs. The major focus in the second decade was the proposed '14–19 Diploma' reforms. The third decade showed a strong focus on grade boundaries and marking (associated with the GCSE English grade decline) and on the 'Gove reforms'. Over all decades, the proportion of coverage attributed to topics related to reporting of results increased.

- Searches for usage of specific words and phrases indicated a possible decline in the prominence of debates around "slipping standards", and that criticism of "grade inflation" and "dumbing down" might have peaked in the 2000s to mid-2010s, declining thereafter. There were no clear trends in coverage of individual exam boards, but coverage of errors, mistakes, and appeals was highest during the summer exam series, after results were released, and following the annual report into each year's summer series. The analysis also confirmed an increasing focus on English and maths, and confirmed opposing trends in the coverage of teachers and students (i.e., stable or increasing usage of "student", but declining usage of "teacher"). Educational 'buzzwords', such as "teaching to the test", were not found as commonly as expected, although this might reflect a limitation of the approach, with short phrases more difficult to find than individual words.

- In conclusion, news coverage of GCSEs is tightly tied to the annual exam cycle and, in particular, the release of results in August. Moreover, coverage of results has increased over time. One consequence is that the overall language used about GCSEs may be more positive than anticipated, as good results are celebrated despite criticisms of the system. Reforms provide a major focus of coverage, and since the introduction of GCSEs there has been little time when reform was not a major topic. Despite increasing coverage of the exam system, topics related to exams were associated with some of the most negative sentiment scores. Criticism of "grade inflation" and "declining standards" may have contributed to gradually declining sentiment, but the biggest decline was associated with falling grades, which appeared to lead to increased scrutiny and criticism of the exam system. Providing clear explanations of the exam system might help to improve understanding and, accordingly, the sentiment associated with coverage of exams. However, findings relate primarily to GCSEs as they were until 2015: it is too early to fully evaluate the impacts of recent reforms on how GCSEs are portrayed by the news media.

Introduction

The news media both reflects and shapes public opinion, particularly for topics about which the public have only partial knowledge (e.g. Gamson & Modigliani, 1989; Happer & Philo, 2013; Lippmann, 1922; McCombs & Shaw, 1972; Scheufele & Tewksbury, 2007). Even if news coverage does not influence specific opinions, by choosing which stories to focus on, the news media can set the agenda for public discourse (McCombs, 2014), a situation summarised by B. C. Cohen (1963) as "[The news media] may not be successful much of the time in telling people what to think, but it is stunningly successful in telling its readers what to think about" (p. 13).

Education is often a major focus of news coverage (e.g. Semetko & Valkenburg, 2000). In the UK, the amount of education news coverage increased substantially throughout the 1980s and 1990s, reflecting increased political attention (Baker, 1994; Hargreaves, Cunningham, Hansen, McIntyre, & Oliver, 2007; MacMillan, 2002; Shannon, 2005). Given the importance of the news media in setting the agenda for public discourse, and potentially in influencing opinion, understanding media coverage of education is increasingly important.

Media coverage can be analysed via content analysis, in which the topics covered and language used in reporting are examined. Content analysis of news stories about education has been carried out in a range of countries and a range of settings. The reporting of the Programme for International Student Assessment (PISA) test results has been analysed in Australia (Baroutsis & Lingard, 2017), Canada (Stack, 2006), and Israel (Yemini & Gordon, 2017). Coverage of issues relating to teachers has been analysed in the USA (J. L. Cohen, 2010) and the UK (Hargreaves et al., 2007). Reporting on problems in the education system has been analysed in Australia (Blackmore & Thorpe, 2003; Thomas, 2003) and the USA (Camara & Shaw, 2012). In the UK, particular attention has been given to the annual reporting of exam results, which forms a key part of education news coverage (Billington, 2006; Shannon, 2005; Warmington & Murphy, 2004, 2007).

Across these analyses, a common theme is that the news media is often perceived to be critical of the education system, with coverage focusing on problems, or creating narratives of crises. It has been argued that, to some extent, this focus is appropriate: a key function of the media is to report on problems that should be fixed (Baker, 1994). However, criticisms can result from inappropriate use of data or oversimplification of complex situations (Mansell, 2013), and repeated criticism can lead to those working in the education system feeling under attack and demotivated (Shine, 2017). In the case of exam results coverage in the UK, negative media coverage could reduce trust in the system and in qualifications themselves (Newton, 2005; Simpson & Baird, 2013). Hence, existing content analyses suggest that negative coverage is common, and that this can adversely affect the education system.

Traditional content analysis methods are time-intensive: a sample of documents must be acquired, and then a coding scheme must be derived and applied to each document (Krippendorff, 2004). Consequently, many analyses focus on detailed examination of few articles from a limited time period. Even when relatively large numbers of articles have been analysed (e.g., 846 articles about exam results analysed by Shannon, 2005), certain restrictions are required to keep sample sizes manageable, such as only considering headlines, particular weeks of the year, or particular sources. However, when coverage has been analysed over longer time periods, interesting patterns have emerged, such as the

finding that A levels were subject to criticism as far back as the 1950s (Shannon, 2005), or that coverage of teachers has become more positive in recent years and has moved away from the language of crisis and conflict (Hargreaves et al., 2007). It may therefore be beneficial to consider larger, longer-term samples of documents to gain a fuller picture of media coverage of education, but this would be challenging using traditional methods.

In recent years, methods that treat text as data have become increasingly accessible, enabling automated, quantitative analysis of documents. "Text mining" is the application of these methods to unstructured (i.e., with no formal, pre-defined structure) text data, with the goal of identifying patterns and trends (Aggarwal & Zhai, 2012). These methods allow large volumes of text to be analysed, albeit often with substantial simplification (e.g., not considering the position of words in a sentence; Aggarwal & Zhai, 2012). Common applications include description of trends over time, identification of topics, and quantification of sentiments. Such methods have great potential for educational research (Zanini & Dhawan, 2015) and have already been used within the Cambridge Assessment Research Division to analyse social media messages about exams (Sutch & Klir, 2017). Hence, these methods could be applied to news coverage of the UK education system. Indeed, content analysis of media coverage of massive open online courses (MOOCs) has previously been carried out (Kovanović, Joksimović, Gašević, Siemens, & Hatala, 2015), allowing nearly 4,000 news articles from nearly 600 sources over 6 years to be analysed. Applying such methods to media coverage of the education system more broadly would allow a large sample of articles to be analysed, from a range of sources, over multiple years, thus providing a broader view than might be achievable with traditional methods.

Given the high profile of exam results in the UK and the apparently negative coverage (e.g. Mansell, 2013; Newton, 2005; Warmington & Murphy, 2004, 2007), it may be beneficial to use text mining techniques specifically on news coverage of high-stakes exams. It has been argued that exam boards should engage more closely with the media to improve the image of the system, to increase trust, and to reduce criticism (e.g. Billington, 2006; Mansell, 2013; Murphy, 2013; Newton, 2005). However, any such engagement would be aided by establishing the current state of news coverage, and studying how it has changed over time.

The aim of this research was therefore to carry out text mining of news articles about high-stakes exams in the UK, to examine the nature of news coverage around this highly visible part of the education system. Specifically, news coverage of General Certificate of Secondary Education (GCSE) qualifications was examined; previous content analyses have focused on coverage of General Certificate of Education Advanced level (GCE A level; hereafter, "A level") qualifications (Shannon, 2005; Warmington & Murphy, 2004, 2007), so GCSE coverage remains little-studied. GCSEs are academic qualifications typically taken by students at age 14 – 16 in England, Wales and Northern Ireland. GCSEs were taught from 1986, replacing General Certificate of Education Ordinary level (O level) and Certificate of Secondary Education (CSE) qualifications; the first final exams were sat in 1988. The GCSE was intended to provide a single qualification covering a wider ability range than the qualifications it replaced. Further, GCSEs included more varied assessment methods, notably using coursework as well as written examinations. It has been suggested that wider coverage (and criticism) of education standards in the news media coincided with the introduction of GCSEs (Shannon, 2005). Indeed, since the introduction of GCSEs, concerns have been expressed in the media about "grade inflation", in which more students were seen

to be gaining high grades, and about an apparent decline in standards[1]. Perhaps as a consequence of these debates, various reforms have been attempted. In 1994, the A* grade was introduced to differentiate high-attaining candidates. In 2004, proposals were put forward to replace both GCSEs and A levels with a single Diploma qualification, but the reforms were not carried out. In 2013, substantial reforms were announced, switching from 'modular' to 'linear' exams, removing coursework and changing to numbered grades; the first exams for these reformed GCSEs were sat in summer 2017. Hence, from its introduction, the GCSE has been subject to criticism and reform. Despite this, it remains a major part of the education system, and the release of results in late August forms a major news 'event' every year (Murphy, 2013; Warmington & Murphy, 2004). News coverage of GCSEs is therefore an important and under-studied area, and the introduction of recent reforms makes analysis of this topic particularly timely.

In this research, text mining methods were applied to the coverage of GCSEs in the UK press, considering articles published from 1988, the first year of GCSE exams, to late 2017, the period following the first reformed GCSE exams. The most common words used were identified, article sentiment was quantified, and the topics written about were classified. As the approach to education coverage can differ between broadsheets and tabloids (e.g. Baker, 1994), each of these analyses was carried out first across all articles, and then separately for broadsheets, tabloids, and a specialist education publication. Finally, analyses were repeated to examine change over time. Word frequencies, sentiment, and topic coverage were analysed for each decade, to examine changes in coverage over 30 years, and for each month, to examine patterns in coverage within years. Continuous measures of sentiment and topic coverage over time were also calculated to examine finer-scale patterns of change. Hence, the research provides a quantitative view of news coverage of GCSEs since their introduction, which should aid understanding of public discourse around exams and support future engagement around this key area of the education system.

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[1] See, for example, Judd, J. (1994, August 26). The healthy upside to falling standards: GCSE and A-level exams probably are less tough to pass than in the old days. But that is no bad thing. *The Independent*. https://www.independent.co.uk/voices/the-healthy-upside-to-falling-standards-gcse-and-a-level-exams-probably-are-less-tough-to-pass-than-1385821.html, accessed April 9, 2018.
See also Ahmed, K. (2002, July 21). Easy exams make pupils unfit for jobs, say bosses. *The Observer*. https://www.theguardian.com/politics/2002/jul/21/uk.highereducation, accessed April 9, 2018.

Methods

Article acquisition
Articles were downloaded from the *LexisLibrary* database
(http://www.lexisnexis.com/uk/legal/)[2], accessed via Cambridge University Library. The database primarily holds legal documents, but also contains news articles from the UK print media. News articles from a range of sources are stored, including print and online editions of UK national broadsheets and tabloids. The time span of available articles varies among sources, but all sources provide articles up to the present.

Searches were carried out on 23 November, 2017, using the *LexisLibrary* search tool. The search term was "GCSE", with "3 or more mentions" selected to improve relevance of results. The "sources" field was set to "UK national newspapers"; searches were then repeated with "sources" set to the *Times Educational Supplement* (now known as *Tes*; hereafter referred to as "*TES*"). "Subject" was set to "Education and Training". The first date considered was 1 January, 1988 (the first year in which final GCSE examinations were sat), so the total time span was 29 years and 11 months. There is a limit of 500 articles per download, so the "date" field was used to specify time spans such that each search returned no more than 500 results. In total, 19,203 articles were downloaded as plain text files.

Initial processing
The first stage of processing was to split files into separate articles and extract metadata. Text files were manually examined to understand their structure: every article started by listing the source, date, headline, section and length, and most gave a byline; every article ended with a load date and a statement of the article's language. Files were then read into R version 3.4.2 (R Core Team, 2017), and the "grep" function was used with regular expressions[3] to find these repeated features.

Article start locations were identified by finding the date field (lines only containing a date, preceded by an empty line). Article end location was identified by finding the phrase "Language: English", which occurred at the end of each article. These start and stop locations were used to split each file into individual articles.

"Source", "date", "title", and "section" fields were extracted using regular expressions. Some elements of the "source" field were not always applied (e.g., the addition of "first edition" to the source name), so these were removed to standardise source names (e.g., "*The Guardian*", rather than "*The Guardian (London)*"). Not every field was available for every article, meaning that "title" contained 21 missing cases and "section" contained 1,653 missing cases. Article text was extracted by reference to locations of "length" and "language" fields, which always occurred immediately before and after the text.

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[2] Site terms of use were examined in advance of any work taking place to ensure the intended analyses complied.

[3] A regular expression is a sequence of characters that defines a text pattern. By specifying the types of character (e.g., alphabetical, numeric, punctuation, or spaces) and the order in which they occur, a search can be carried out to identify all instances of that pattern. Whole words can also be included. For example, following the R implementation, a search for "January [[:digit:]]{1,2} [[:digit:]]{4}" would find all dates written in the format "January *dd yyyy*", allowing for the day to contain either one or two digits, whilst requiring the year to contain four digits.

Sources were classified as broadsheet, tabloid or specialist. Sources were also classified as being print or online, based on the presence of "online", ".co.uk" or ".com" in the source name. This print/online distinction may be imperfect though, as articles ostensibly in the print edition may have actually been published online (e.g., articles attributed to *The Independent* continued to 2017, despite the print edition ceasing in 2016). Dates were processed to produce separate day, month, and year fields.

In some instances, minor updates or corrections were included as separate articles. Consequently, the textreuse R package (Mullen, 2016) was used to identify near-duplicates. Jaccard similarity was calculated between pairs of articles using the MinHash algorithm with 50 MinHash values and 10 buckets[4], with article pairs flagged as similar if Jaccard similarity was greater than 0.25; these values were chosen based on initial trials of various values. Within flagged pairs, the longer of the two articles was retained, as this typically contained the original article and any subsequent updates.

Finally, articles primarily reproducing tables of numbers (e.g., league tables) with limited further interpretation were removed, as large tables with repeated words and numbers could skew results toward table contents. Hence, any article where numbers constituted over 25 per cent of the total 'words' was removed. This figure was based on trialling different thresholds: at higher or lower percentages, filtering seemed too lenient or strict. This processing led to a corpus of 15,084 articles.

Identifying relevant articles

Although filters were applied during searches, some articles were still of limited relevance, so further filtering was applied. First, articles containing fewer than four occurrences of the word "GCSE" were excluded, as these were often less relevant (e.g., stories incidentally mentioning GCSEs held by celebrities). The exception to this filtering was articles with "GCSE" in the title, for which relevance was assumed. Hence, articles containing "GCSE" at least four times *or* in the title were included.

Articles were filtered by the "section" field to ensure they were primarily news or opinion. Based on a review of all possible "section" entries, articles from the following sections were retained: "news", "opinion", "comment", "editorial", "education", "leader", "home", and "front". In earlier editions of *The Times*, and in all *Daily Mail* and *Mail on Sunday* articles, the "section" field did not contain useful entries, so no section filtering was performed on these articles. Not all articles included a "section" field, so blank fields were allowed.

Finally, a small number of articles were live blogs or interactive features. As the intended focus was news and opinion articles, these were removed. Articles with "blog" or "as it happened" in the title were removed, as were articles that contained only a single sentence (which were found to typically be interactive features). The final filtered corpus contained 6,831 articles. Table 1 describes the composition of the final corpus.

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[4] For more information on the textreuse R package, document similarity metrics and the MinHash algorithm, see https://cran.r-project.org/web/packages/textreuse/vignettes/textreuse-introduction.html, https://cran.r-project.org/web/packages/textreuse/vignettes/textreuse-minhash.html, and https://cran.r-project.org/web/packages/textreuse/vignettes/textreuse-pairwise.html, all accessed August 8, 2018.

Table 1: Composition of the final corpus used in analysis
Note: Sources are sorted by the total article count. Source names follow the styling used in *LexisLibrary*.

Source	Source type	Format	First year	Final year	Articles
The Guardian	Broadsheet	Print	1988	2017	1,111
The Times	Broadsheet	Print	1988	2017	746
The Independent	Broadsheet	Print	1988	2017	695
Daily Mail	Tabloid	Print	1992	2017	683
telegraph.co.uk	Broadsheet	Online	2011	2017	625
TES	Specialist	Print	1999	2017	534
The Daily Telegraph	Broadsheet	Print	2004	2017	492
MailOnline	Tabloid	Online	2012	2017	295
The Sunday Times	Broadsheet	Print	1988	2017	275
guardian.com	Broadsheet	Online	2005	2014	237
Independent.co.uk	Broadsheet	Online	2011	2016	197
The Mirror	Tabloid	Print	1995	2017	162
The Express	Tabloid	Print	1999	2016	126
i	Tabloid	Print	2011	2017	101
mirror.co.uk	Tabloid	Online	2014	2017	100
Express Online	Tabloid	Online	2013	2017	80
The Sun	Tabloid	Print	2004	2017	77
The Observer	Broadsheet	Print	1994	2017	74
The Sunday Telegraph	Broadsheet	Print	2004	2017	68
The Sunday Express	Tabloid	Print	2000	2013	49
Mail on Sunday	Tabloid	Print	1992	2015	41
Independent On Sunday	Broadsheet	Print	2001	2014	34
Daily Star	Tabloid	Print	2002	2017	20
The Sunday Mirror	Tabloid	Print	1998	2011	5
The People	Tabloid	Print	2005	2012	4

The Guardian was the single largest source, comprising 16% of the corpus. The *Daily Mail* was the largest tabloid source, comprising 10% of the corpus. Broadsheet sources contained 4,554 articles, compared to 1,743 in tabloids and 534 in the specialist *TES*. Print sources dominated, comprising 5,297 articles, compared to 1,534 online articles, although this classification should be treated cautiously.

Text cleaning
Article text was 'cleaned' to allow text mining to be carried out. This was primarily carried out using the "gsub" function in R to remove or replace words.

Words related to examinations were modified to ensure that subsequent processing would not remove them and to standardise forms: this involved changing "A level" and "A-level" to "Alevel", "O level" and "O-level" to "Olevel", "A*" to "Astar", "As" (i.e., plural of "A") to "gradeAs", "course work" to "coursework", "per cent" to "percent", and "examination" to "exam". Note that in the case of "gradeAs", case-sensitive searches were used to avoid the word "as", but sentences starting with the word "As" *would* be replaced; it was assumed that this would not occur frequently enough to substantially affect results.

Text that provided little useful information was removed. Newspapers frequently referenced themselves (e.g., "a *Telegraph* investigation has found…"), so source names (and common

variants, e.g., "*Education Guardian*") were removed. Text directing readers to other stories or indicating a section were removed: these were "Full text", "Abstract", "Related:", "Read more about…" and "show more…" The phrase "Education correspondent" was removed, as it was sometimes included in article text. Web addresses and their shortened forms were removed, although the range of possible structures meant that regular expressions may not have identified every case. Photo credits, press agency credits, non-standard characters, and currency symbols were removed. Finally, some online articles contained html and xhtml languages, so regular expressions were used to identify and remove this code.

All characters were converted to lowercase, as some methods treat uppercase and lowercase letters differently. Punctuation was removed. Article text was then split into individual words, or 'tokenised', using the tidytext R package (Silge & Robinson, 2016). Following this, the dataset contained a single row for every word in every article.

Many remaining words were 'stop words', which are commonly used words that convey limited content (e.g., "a", "the", "and", "but", "me", and "you"). These were removed before analyses were carried out (this is why "As" was changed to "gradeAs" as described above, because "as" is a stop word, so would have been removed; note that after stop word removal, "gradeAs" was converted back to "As"). Stop words were taken from the "SMART" and "snowball" lists[5] available in the tidytext R package. Some stop words were potentially relevant, so were excluded from removal[6]. However, some of these retained words could have inflated counts in the final corpus: "up", for example, is vital when discussing results (e.g., "pass rates went up"), but is also part of irrelevant phrases (e.g., "up to you"). All numbers are often removed in text mining, but here, ages and reformed GCSE grades could form an integral part of reporting, so only numbers up to 18 were retained.

Finally, the textstem R package (Rinker, 2017) was used to lemmatise all remaining words. Lemmatisation groups together inflected forms of a word whilst retaining their grammatical form. For example, "examinations" would become "examination", but "examined", "examines" and "examining" would all become "examine". This is similar to the process of 'stemming', which reduces all related words to the same stem, such that "examinations", "examination", "examined", "examines", and "examining" would all become "examin". However, stemming can limit interpretation, so lemmatisation was preferred. Lemmatisation often requires morphological analysis, but the implementation in R is dictionary-based[7]. Before lemmatisation, "better", "best", "worse" and "worst" were removed from the dictionary to avoid conversion to "good" and "bad", and comparative numeric words ("fourth", "tenth", etc.) were removed to avoid conversion to numbers. As the dictionary did not contain exam-specific plurals (e.g., "GCSEs"), these were manually converted to singular forms. Note that in the rest of the report, where specific words are discussed in the context of results, the processed form is used (e.g., "physic" rather than "physics").

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[5] The "snowball" list is available at http://snowball.tartarus.org/algorithms/english/stop.txt, accessed March 5, 2018. The "SMART" list is from a published paper (Lewis, D. D., Yang, Y., Rose, T. G., & Li, F. (2004). RCV1: A new benchmark collection for text categorization research. *Journal of Machine Learning Research*, *5*, 361-397); the list can be accessed via the tidytext R package. Note that another list, the "onix" list, is available via tidytext, but it was considered to contain too many relevant words, so was not used.

[6] Words excluded from 'stop word' removal were: "best", "better", "brief", "changes", "concerning", "consider", "considering", "contain", "containing", "contains", "course", "different", "down", "downwards", "further", "immediate", "inner", "least", "less", "necessary", "new", "old", "up", and "welcome".

[7] The dictionary is available at http://www.lexiconista.com/datasets/lemmatization/, accessed March 5, 2018.

After processing, the corpus contained 6,831 articles, 2,016,784 words in total, and 34,383 unique words. The minimum article length was 14 words, the maximum was 6,957 (which was an online article compiling multiple smaller stories about results), the median was 261, and the mean was 302.8. This final corpus was the basis for all analyses.

Analysis: frequency-based measures

The analyses carried out were informed by those demonstrated by Silge and Robinson (2017) for text mining in R. The first stage was to calculate frequency-based measures to identify common words. In the simplest approach, the 30 most frequently used words overall were identified. Then, the wordcloud R package (Fellows, 2014) was used to produce word clouds[8] of up to 150 words. Simple frequencies could, however, present a skewed picture if words were 'clustered' (i.e., a word could occur many times in few articles), so the number of articles in which each word occurred was calculated. Finally, word counts of each word within each article were calculated, and correlated against counts of "GCSE" to identify frequently co-occurring words, using the widyr R package (Robinson, 2017). For this correlation analysis, the corpus was restricted to words with a total count greater than or equal to the 90th percentile (49 occurrences), as uncommon words could show artificially inflated correlations. These analyses were carried out for all sources, and then broadsheets, tabloids, and the specialist press separately.

Analysis: sentiment analysis

The next stage was to consider the sentiments expressed in articles. Sentiment in language is a complex construction, which automated analyses may not be able to adequately describe. However, dictionaries can assign sentiments to words, allowing a rudimentary assessment based on word/sentiment frequencies. One dictionary commonly used for this is the 'Bing lexicon' (Hu & Liu, 2004), which classifies words as positive or negative[9], and which is available in the tidytext R package. It contains 2,006 positive words and 4,782 negative words. This dictionary was used to assign sentiment to words in the corpus: any words not in the dictionary remained unclassified. Overall, 217,824 words were classified (10.5% of the corpus), with 3,556 unique words classified (10.3%).

Before applying sentiments to the corpus, the dictionary was edited to remove words where the associated sentiment might be inappropriate in an educational context. Removed words were "bs", "conservative", "harrow", and "mock" (all negative), and "comprehensive", "reform", "reforms", "reforming", "selective", "soft", and "work" (all positive). Despite this, some words retained sentiments that would not always be appropriate. For example, "hard" is negative: this would be appropriate if exams were "too hard", but inappropriate if they were "not hard enough". More subtly, "tough" was positive; this would be appropriate if "tough new exams" prevented grade inflation, but inappropriate if "tough new exams" caused student stress. Words with multiple meanings could also present problems: "appeal" was classed as positive, which it would be if qualifications "appealed to universities", but which it would not be if students "appealed to exam boards" about their results. Hence, sentiment scores must be viewed with caution.

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[8] Word clouds are visual representations of word frequencies, such that words are produced in a cluster with font sizes scaled in proportion to frequencies. In a commonly used format, the most frequent words are in the centre of the cluster and less frequent words are further out.

[9] The Bing lexicon is available at https://www.cs.uic.edu/~liub/FBS/sentiment-analysis.html, accessed March 5, 2018. It is based on text mining of online reviews to identify words commonly used to indicate negative or positive sentiments.

The top 20 words for each sentiment were identified, and word clouds with up to 100 words per sentiment were produced. As a simple metric of overall sentiment, proportions of positive and negative words were calculated. Articles were classed as being positive, neutral, or negative by summing assigned sentiments (i.e., an article with 3 positive and 2 negative words would have a net sentiment of 1, making it positive; an article with 10 positive and 15 negative words would have a net sentiment of -5, making it negative; neutral articles had a net sentiment of 0). Again, analyses were carried out for all sources, then broadsheets, tabloids, and the specialist press separately. These measures should be interpreted cautiously. For example, an article might criticise GCSEs but present a sole contrasting opinion at the end: if the opinion contained enough positive words, the article could be classed as positive even if a human would consider it to be negative. Hence, sentiment summaries should not be seen as accurate *absolute* measures, but comparisons between sources or over time should provide appropriate *relative* measures of sentiment.

As a robustness check, sentiment analyses (including temporal analyses described below) were repeated accounting for simple negation (e.g., "no good" becoming negative, "not bad" becoming positive). Results were very similar to those from main analysis, and no inferences would change, so these analyses are not discussed further. Note, however, that effects of complex sentiment constructions could still not be accounted for.

Analysis: topic models
The final method employed was topic modelling, using latent Dirichlet allocation (LDA; Blei, Ng, & Jordan, 2003)[10]. This is based on co-occurrence of words, so words occurring only once in the corpus were removed as, inevitably, these could not co-occur with anything; beyond these excluded words, all other words in the corpus were considered.

The first step was to identify the optimal number of topics. This was done using the ldatuning R package (Murzintcev, 2016), which calculates four metrics that can be used to identify the optimal number: Griffiths and Steyvers (2004) use posterior probabilities from Gibbs sampling, Cao, Xia, Li, Zhang, and Tang (2009) use mean cosine distances between topics, Arun, Suresh, Veni Madhavan, and Narasimha Murthy (2010) use Kullback-Leibler divergence, whilst Deveaud, Sanjuan, and Bellot (2014) use Jensen-Shannon divergence[11]. To find the optimal number of topics, the Arun and Cao metrics should be minimised, whilst the Griffiths and Deveaud metrics should be maximised. 2, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 150, 200, 250, 300, 400 and 500 topics were trialled. To speed up processing, this was carried out on a random 50% of articles. For this, and for fitting of final models, the topicmodels R package (Grün & Hornik, 2011) was used, using Gibbs sampling with 10,000 iterations; 2,500 iterations were kept for estimation, and the first 1,000 were discarded as a burn-in period.

Different metrics indicated differing optimal numbers (see Figure 1): 20 (Deveaud), 60 (Griffiths). 100 (Arun), or 150 (Cao). One hundred topics were considered too many to meaningfully interpret, so the Arun and Cao methods were discarded. Models using the full

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[10] LDA is a statistical technique that assumes a document is made up of multiple topics; each topic is made up of a collection of words; and each word in the corpus has a probability of being associated with each topic. The process identifies co-occurring words that are taken to represent a topic, and assigns a probability for each topic to each document. The number of topics present is specified by the user.

[11] Kullback-Leibler divergence and Jensen-Shannon divergence are measures of how much one distribution differs from another and are used to indicate information loss.

corpus were therefore fitted with 20, 30, 40, 50, or 60 topics, ranging between the Griffiths and Deveaud estimates. For each model, the 20 words with the highest probability were extracted for every topic, and reviewed to assign an initial meaning. A random sample of up to 20 articles assigned to each topic was reviewed to confirm or update the assessment. At 60 topics, articles seemed too finely divided: one topic contained numbers, whilst another contained comparison words (e.g., "gain", "increase"). Moreover, the least-populated topic contained only seven articles. Conversely, at 20 and 30 topics, topics seemed to be grouped: a single topic contained words relating to both history and religion. At 40 topics, grouping still occurred, but it was more coherent (e.g., introduction of GCSEs grouped with the National Curriculum). At 50 topics, there was less grouping, and certain clear topics emerged (e.g., ethnicity). Therefore, further analyses used 50 topics. Notably, this is the intersection of the Griffiths and Deveaud metrics (see Figure 1).
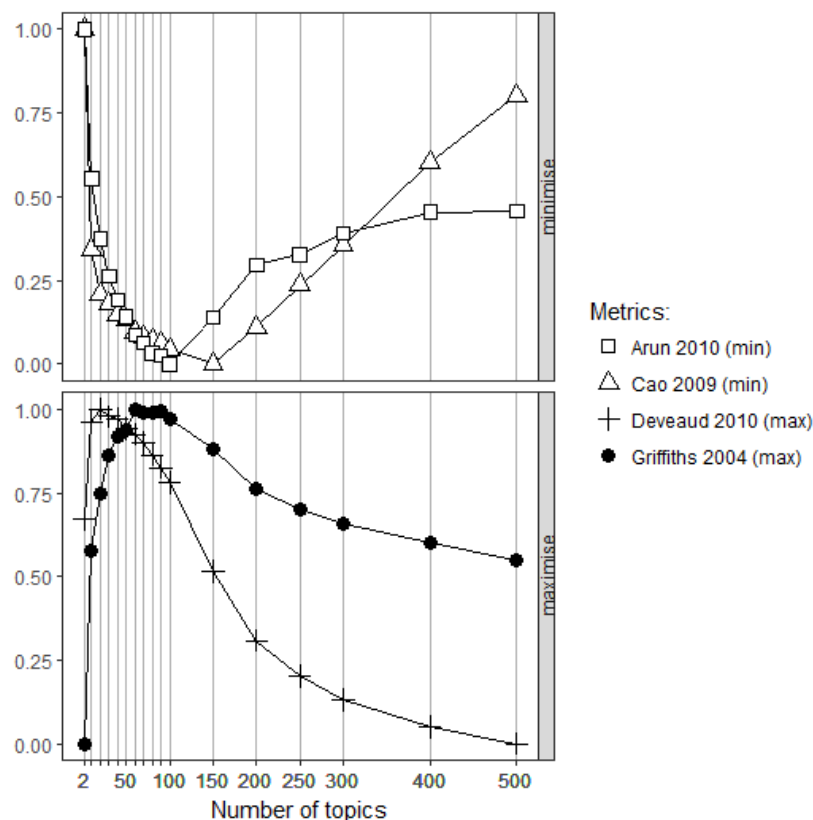
Figure 1: Results of optimal topic number assessment
Note: the y axis is scaled such that 1 is the maximum value for each metric and 0 is the minimum, so the axis is unitless.

Important caveats must be considered in the above processes. The assignment of meanings to topics is subjective, but, with well-defined topics it should be uncontroversial. For example, one topic included "science", "GCSE", "physic" (converted from "physics" in lemmatisation), "chemistry", "biology", and "separate" in the top 10 words; this is clearly about GCSE Science. However, other topics were less well defined, and other researchers might have suggested different interpretations. Similarly, judgement was required to choose the number of topics, and a different researcher might have preferred a different number. Hence, although the topics themselves were automatically determined, topic modelling involved subjective decisions, and this must be considered when interpreting the results. Topic frequency was assessed in two ways. First, each article was assigned to the topic with highest probability, then the number of articles assigned to each topic was calculated; if an

article had multiple topics with equally high probability, it was split between them (e.g., an article with two equally high probabilities would add 0.5 to each topic). Second, probabilities were simply summed across all articles, explicitly acknowledging that articles are mixtures of multiple topics, and arguably providing a more complete view of coverage[12]. Again, this was carried out separately for the whole corpus, broadsheets, tabloids, and the specialist press.

Finally, sentiment scores of articles assigned to each topic (using the first, simpler method of assignment) were used to estimate topic sentiment scores. Whilst caveats about sentiment analysis methods still apply, this should identify the most positive and negative topics.

Analysis: changes over time
All analyses were repeated with a temporal component to understand how coverage changed over time. The number of articles in each decade and each month (aggregated across all years) was calculated. Word counts, word clouds, correlations with "GCSE", sentiment summaries and estimates of topic coverage were produced separately for each decade to examine changes over 30 years, and then for each month (across all years) to examine changes within years.

To give a more continuous measure of sentiment change, article sentiment (the net sentiment divided by the number of assigned words) was plotted against the month of publication. To examine statistical significance, a generalised additive model (GAM) was fitted using the mgcv R package (Wood, 2011); it was assumed that sentiment change might not follow a simple parametric relationship, and the GAM allowed a data-driven, smooth relationship to be fitted. The GAM was fitted with a cubic regression spline with the basis dimension set to 20 (i.e., the maximum allowable effective degrees of freedom); the degree of smoothing was determined by maximum likelihood. To confirm whether the smooth term provided the best fit to the data, the resulting model was compared to linear, quadratic, and cubic models using the Akaike Information Criterion (AIC).

A similar approach was taken to examine changes in topic coverage over the 30 years. The proportion of probability assigned to each topic in each month was plotted over the 30 years to give a continuous measure of change, and GAMs were fitted to examine statistical significance. This was repeated to examine change over months (across all years).

Finally, a list of 'buzzwords' and 'key words' was compiled. This was intended to complement topic modelling, allowing user-specified phrases to be tracked. Words were identified by speaking to colleagues, and by considering hypotheses that arose during the preceding analyses. The proportion of articles in which each key word occurred in each month was calculated, and then plotted over years and months (across all years) to indicate change in usage; GAMs were again fitted to examine significance.

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[12] Under the first method, the article was assigned to whichever topic had the highest probability, so indicated coverage of 'main' topics, but underestimated 'minor' topics, even if they had only slightly lower probability. As an extreme example, consider an article with a probability of 0.501 of being in Topic 1 and 0.499 of being in Topic 2: the first method would assign 1 to Topic 1, whilst the second would assign 0.501 to Topic 1 and 0.499 to Topic 2. The summed probability is always equal to the number of articles, but the distribution of probability varies. Hence, the second method provided a better indication of coverage of 'minor' topics, which may not be the main focus of the article, but which may nonetheless form a key part of coverage. Further, note that maximum probabilities were often low in absolute terms: the median 'maximum probability' was 0.193.

Results

Most frequent words

The 30 most frequent words are presented in Table 2. Note that here, and throughout discussion of results, words are discussed in their processed form, albeit allowing use of uppercase to aid clarity (e.g., "Alevel" rather than "A level"). "School" was the most common word, occurring over 52,000 times; "GCSE" was next, occurring over 38,000 times. These results are to be expected given the focus of the corpus; "education" is in the top 10 for a similar reason. "Year" was third overall, occurring over 28,000 times: this could be linked to the structure of education into school years, or could reflect comparisons between years (e.g., "pass rates rose this year"). Broadsheet and tabloid vocabularies were broadly similar. This could be influenced by the composition of the corpus, with the mid-market Daily Mail contributing most to the tabloid sample (as opposed to mass-market tabloids). Alternatively, it could indicate a genuine similarity in language use between different source types.

"Exam", "grade", "result", and "pass" all occurred in the top 30 words, showing a strong focus on examinations and results: "qualification" only entered the top 10 in the specialist press, perhaps indicating a broader view of the GCSE as a qualification rather than primarily as exams. Related to this, "percent" occurred in the top 10, driven by high usage in tabloids, showing that presenting figures is a key component of reporting. "Astar" was also in the top 30 words for tabloids, implying a focus on the highest grades.

"English" and "maths" were in the top 20 words, showing a focus on 'core' subjects. "Subject" itself appeared in the top 20, but there was limited evidence of other specific subjects being discussed, with "language" occurring in the top 30 overall and in broadsheets, and "science" appearing in the top 20 in the specialist press.

"Pupil" and "student" were in the top 10 words overall, whilst "child" was in the top 20; conversely, "teacher" occurred in the top 20 and there were no other synonyms for teachers in the list. This potentially indicates a stronger focus on students than teachers, with only the specialist press having "teach" in the top 30.

Several other patterns were evident. "Alevel" was in the top 20 words and "university" was in the top 30, indicating a focus on education beyond GCSEs. "New" was in the top 20, showing a focus on novelty and change. "Government" featured in the top 30, showing the importance of politics in education reporting; it did not, however, occur in the top 30 for tabloids. Finally, "up" and "high" were in the top 30; although these counts could be artificially inflated (see Methods), their occurrence could again reflect a focus on high achievement and increasing pass rates (e.g., "highest pass rates ever", or "number of A*s went up").

Table 2: The 30 most frequently used words in the entire corpus, and for broadsheets, tabloids, and the specialist press separately

Note: in this table and all subsequent tables, all words are reported in the form in which they were analysed, i.e., following lemmatisation and other processing, and in lowercase.

Overall		Broadsheet		Tabloid		Specialist	
word	Count	Word	count	word	count	word	count
school	52,013	school	37,040	school	12,304	gcse	3,482
gcse	38,207	gcse	25,315	gcse	9,410	school	2,669
year	28,332	year	19,139	year	7,620	pupil	1,989
exam	26,901	exam	18,464	exam	7,069	year	1,573
pupil	25,763	pupil	16,897	pupil	6,877	exam	1,368
grade	21,703	grade	14,201	grade	6,438	percent	1,188
education	16,091	education	11,471	percent	4,707	grade	1,064
student	14,290	student	9,699	education	3,852	qualification	996
percent	14,083	result	9,268	result	3,729	student	942
result	13,711	subject	9,022	student	3,649	english	878
english	12,776	teacher	8,928	english	3,234	new	864
subject	12,677	english	8,664	maths	3,189	subject	858
teacher	12,563	percent	8,188	up	3,031	teacher	824
alevel	10,670	child	7,590	teacher	2,811	maths	794
child	10,528	alevel	7,464	subject	2,797	course	771
maths	10,523	new	7,049	child	2,635	education	768
new	10,241	up	6,666	alevel	2,619	result	714
up	10,237	maths	6,540	study	2,377	study	660
make	9,225	make	6,505	new	2,328	science	644
study	9,058	study	6,021	astar	2,156	language	601
work	8,218	government	5,915	make	2,134	alevel	587
government	8,120	work	5,741	high	2,095	make	586
qualification	7,872	time	5,371	pass	2,039	government	577
course	7,790	course	5,331	work	2,024	up	540
high	7,647	qualification	5,225	girl	1,907	teach	503
time	7,615	language	5,186	university	1,890	vocational	481
language	7,208	high	5,171	time	1,847	board	478
number	7,124	system	5,085	old	1,813	work	453
system	7,102	number	4,996	achieve	1,779	achieve	448
university	6,933	university	4,791	number	1,744	level	430

To explore the wider vocabulary used, word clouds were produced. Only the word cloud for the overall corpus is presented (see Figure 2); broadsheet, tabloid, and specialist word clouds are presented in the Appendix (see Figure A1, Figure A2, and Figure A3). In this wider set, words related to assessment became evident, including "assessment" and "coursework". Words related to exam administration also became evident, with "Ofqual" and "board" appearing. Words related to school governance, such as "academy", "grammar", "independent" and "college", were also found.

Figure 2: Word cloud from the whole corpus

Note: Font sizes are proportional to the word's frequency in the corpus, and more frequently used words are nearer the centre. Colours are applied relative to the normed frequency, such that orange words are ≤20% of the maximum, purple words are ≤40% of the maximum, etc.

The number of articles in which each word occurred was also calculated (see Table 3). There were few substantial differences between the order using this method and when using the total word count. One notable difference was "percent", which dropped from 9th when using total word count to 25th here, suggesting that "percent" is clustered in particular articles. At the lower frequencies there was more change, with words such as "university", "system", and "language" no longer in the top 30, but "old", "achieve", and "good" appearing. There was little difference between broadsheets and tabloids, but the specialist press again differed from the general press, including words such as "curriculum" and "report".

Table 3: The top 30 words based on the number of articles that each word occurs in
Note: "GCSE" is excluded as it occurred at least once in every article.

Overall		Broadsheet		Tabloid		Specialist	
word	articles	word	articles	word	articles	word	articles
school	6,217	school	4,204	school	1,540	school	473
year	6,051	year	4,077	year	1,524	year	450
pupil	5,588	pupil	3,683	pupil	1,467	pupil	438
exam	5,467	exam	3,659	exam	1,426	exam	382
education	5,158	education	3,562	grade	1,245	education	352
grade	4,757	grade	3,201	education	1,244	qualification	334
up	4,345	make	2,940	up	1,164	new	333
make	4,229	subject	2,890	result	1,068	grade	311
result	4,168	up	2,885	student	1,022	subject	309
student	4,117	result	2,832	make	995	student	305
subject	4,110	teacher	2,823	english	966	up	296
teacher	4,058	student	2,790	teacher	954	make	294
english	3,957	english	2,735	percent	922	percent	294
new	3,854	new	2,642	subject	911	government	287
time	3,726	time	2,611	maths	908	teacher	281
government	3,630	government	2,561	high	900	result	268
high	3,575	high	2,436	study	884	study	265
study	3,487	study	2,338	new	879	course	265
work	3,356	number	2,316	time	871	english	256
maths	3,339	work	2,294	old	850	teach	255
number	3,270	child	2,283	child	843	work	249
child	3,257	alevel	2,228	work	813	week	247
alevel	3,224	maths	2,197	pass	813	time	244
qualification	3,158	include	2,114	alevel	786	high	239
percent	3,148	qualification	2,107	government	782	curriculum	236
include	3,096	good	2,083	show	778	include	235
good	3,020	course	2,067	achieve	773	maths	234
old	3,019	system	2,060	include	747	achieve	233
achieve	3,011	secretary	2,011	number	746	report	227
course	2,992	achieve	2,005	good	735	national	217

The final frequency-based measure explored was the correlation between *within-article* word counts for "GCSE" and all other words. "Grade" showed the strongest correlation overall, but this was still relatively weak (0.379); this reflects the previously described focus on results, as does the occurrence of "result", and "Astar" in the top 10. A notable finding was the occurrence of "9" in the top 20, and both "9" and "7" in the tabloid top 10; this is probably linked to the top grades in reformed GCSEs. Core subjects showed strong associations, with "English" and "maths" both occurring in the top 10 overall. Indeed, "English" showed the strongest correlation in tabloids (0.531). Several comparison words appeared in the top 30, with "fall", "compare" and "change" highlighting the focus on comparisons of results over time. The specialist press showed quite different patterns, with "academic" and "vocational" featuring highly, and more technical terms such as "benchmark" appearing.

Table 4: Top 30 strongest Pearson correlations with the within-article word count for "GCSE"

Overall		Broadsheet		Tabloid		Specialist	
word	correl.	word	correl.	word	correl.	word	correl.
grade	0.379	year	0.299	english	0.531	qualification	0.303
english	0.350	grade	0.295	grade	0.530	academic	0.294
year	0.319	subject	0.263	new	0.491	association	0.268
new	0.307	result	0.261	maths	0.467	vocational	0.260
maths	0.306	english	0.258	9	0.438	grade	0.257
result	0.306	exam	0.256	achieve	0.434	increase	0.246
astar	0.305	pupil	0.253	7	0.430	resits	0.243
pupil	0.300	astar	0.235	system	0.425	general	0.243
exam	0.295	achieve	0.218	astar	0.417	less	0.237
achieve	0.291	number	0.215	pupil	0.417	new	0.230
subject	0.287	maths	0.214	result	0.411	subject	0.226
system	0.251	sit	0.211	exam	0.406	benchmark	0.225
9	0.248	new	0.209	literature	0.393	number	0.223
number	0.245	entry	0.208	9s	0.393	resit	0.221
entry	0.242	high	0.207	year	0.382	pupil	0.219
qualification	0.242	take	0.206	16	0.376	impact	0.218
16	0.241	qualification	0.203	old	0.376	government	0.216
top	0.238	olevel	0.200	score	0.372	time	0.214
fall	0.235	course	0.197	compare	0.369	dunford	0.213
high	0.235	include	0.189	gain	0.365	exam	0.210
down	0.232	time	0.189	down	0.365	system	0.207
sit	0.231	fall	0.183	top	0.362	introduce	0.205
old	0.230	system	0.181	subject	0.356	year	0.205
compare	0.230	range	0.179	performer	0.356	maths	0.205
take	0.225	early	0.178	percent	0.339	gnvqs	0.202
pass	0.218	change	0.178	resits	0.338	course	0.200
percent	0.218	16	0.177	fall	0.337	sit	0.197
change	0.211	core	0.175	mark	0.336	continue	0.197
point	0.211	show	0.175	pass	0.336	english	0.196
show	0.210	student	0.173	tough	0.331	end	0.196

Sentiment analysis

Words were classified as either negative or positive, and the 20 most frequent words associated with each sentiment were identified (see Table 5 and Table 6). When viewing these results, it must be considered that context is not considered (e.g., "improve" occurs in the top 10 positive words, but this could be part of a negative sentiment such as "schools must improve"), and only around 10 per cent of words were assigned a sentiment.

"Good" and "top" were the most frequent positive words (see Table 5), suggesting a focus on "good results", "top grades" or "top students"; the occurrence of "better" and "best" in the top 10 also related to such topics, but indicated a greater focus on the highest performance. Other positive words indicated a focus on change over time, with "improve" and "progress" in the top 20. However, negative usage, such as "must improve" or "limited progress", could cause these words to be over-represented. Influence of results coverage could also be seen in the occurrence of "gain", "achievement", "success", and "award" in the top 20. "Skill" was in the top 10 overall, and was the top word for the specialist press, suggesting that GCSEs are associated with gaining skills (although "no skill" or "lacking skills" could be negative uses). Broadsheets, tabloids, and the specialist press had similar positive words: in part, this reflects the limited number of words matched from the dictionary. However, some differences were still noted. "Top" was the top positive word for tabloids, perhaps reflecting a greater focus on the highest achievers; this may also be suggested by the occurrence of "bright". "Tough" also appeared in the tabloid top 20, potentially indicating a focus on "tough" exams, which may be genuinely seen as positive. Related to this, "easy" occurred in the top 20 positive words overall, but it is perhaps unlikely that easy exams would genuinely be described as positive.

"Fail" was the top negative word overall, for broadsheets, and for tabloids (see Table 6). This could refer to students failing exams, but could also be used in the context of "failing system" or "failing our children". "Fall" was the second most common negative word, reflecting the focus on changes over time, such as a falling pass rate or suggestions of falling standards; a similar reason explains the occurrence of "decline". Some negative words, such as "concern" and "problem", reflected the types of narrative that make up negative stories. "Difficult" and "hard" clearly related to difficulty, but again, it is unclear that these would always be used in a truly negative sense. Several words possibly reflected impacts on students or teachers, with "fear", "worry", and "struggle" featuring in the top 20. Also notable was the inclusion of "disadvantage", which might correspond to socio-economic disadvantage, or even to students being disadvantaged by aspects of the system.

A wider set of words was plotted as a word cloud (see Figure 3). Positive words related to results, top performers, progress, improvement, and benefits of education. Negative words related to declines, falls, problems, failure, and negative impacts. Word clouds for different source types are presented in the Appendix (see Figure A4, Figure A5, and Figure A6); there was no clear difference with the sentiment word cloud produced from the whole corpus.

Table 5: Top 20 words classified as positive in the corpus

Overall		Broadsheet		Tabloid		Specialist	
word	**count**	**word**	**count**	**word**	**count**	**word**	**count**
good	6,032	good	4,276	top	1,723	skill	368
top	5,040	top	3,141	good	1,424	good	332
skill	3,962	skill	2,738	better	1,015	improve	252
better	3,806	better	2,542	gain	965	better	249
lead	3,199	lead	2,321	best	859	gain	234
gain	3,176	award	2,197	skill	856	lead	197
improve	3,122	improve	2,193	award	755	top	176
award	3,119	best	2,044	lead	681	award	167
best	3,031	gain	1,977	improve	677	encourage	145
great	2,363	great	1,639	great	613	support	143
easy	1,991	favour	1,382	easy	571	achievement	128
favour	1,946	support	1,372	bright	519	best	128
support	1,909	easy	1,317	favour	468	progress	124
achievement	1,834	achievement	1,260	success	458	success	119
success	1,769	important	1,231	achievement	446	great	111
encourage	1,766	modern	1,201	encourage	421	important	110
important	1,670	encourage	1,200	tough	398	improvement	106
modern	1,670	improvement	1,195	support	394	worth	105
improvement	1,601	success	1,192	modern	373	easy	103
progress	1,533	free	1,126	clear	369	clear	100

Table 6: Top 20 words classified as negative in the corpus

Overall		Broadsheet		Tabloid		Specialist	
word	**count**	**word**	**count**	**word**	**count**	**word**	**count**
fail	3,722	fail	2,556	fail	981	concern	207
fall	3,076	fall	2,012	fall	927	fail	185
hard	2,747	problem	1,953	hard	821	problem	167
problem	2,693	concern	1,946	problem	573	fall	137
concern	2,682	hard	1,816	poor	566	issue	125
poor	1,959	poor	1,319	concern	529	hard	110
issue	1,518	issue	1,116	miss	484	difficult	95
difficult	1,313	difficult	936	difficult	282	poor	74
decline	1,217	decline	882	issue	277	scrap	72
miss	1,192	scrap	742	decline	274	risk	65
scrap	1,088	wrong	695	scrap	274	fear	64
wrong	1,006	disadvantage	671	failure	263	lack	62
disadvantage	965	miss	665	worry	260	decline	61
worry	951	worry	652	wrong	260	disadvantage	57
failure	938	lack	645	fear	255	struggle	53
fear	937	failure	630	lose	250	wrong	51
lose	896	fear	618	worst	241	difficulty	49
lack	894	lose	609	break	238	criticise	47
struggle	853	risk	598	disadvantage	237	failure	45
risk	822	struggle	582	struggle	218	break, deprive, miss	43

Figure 3: Word cloud of words assigned with positive and negative sentiments

Note: negative words are coloured orange and positive words are coloured blue. Otherwise, interpretation of the word cloud is the same as for Figure 2.

Sentiment summaries were produced, taking into account assigned sentiment and word frequencies. Against expectations, the corpus overall, and every source type, showed net positive sentiment (see Table 7). Overall, 54.0% of assigned words were positive, accounting for 5.7% of words in total. In broadsheets, 54.3% of assigned words were positive (5.7% of total words); in tabloids, 52.5% of assigned words were positive (5.7% of total words); and in the specialist press, 57.6% of words were positive (5.5% of total words). When net sentiment was used to classify articles, 58.0% were positive and 4.6% were neutral. In broadsheets, 58.7% of articles were positive and 4.2% were neutral; in tabloids 54.3% were positive and 5.3% were neutral; and in the specialist press 63.0% were positive and 6.0% were neutral. However, an article could be classed as positive even with net sentiment of +1, so the mean net sentiment was calculated for each classification. Overall, for broadsheets, and for tabloids, the mean net sentiment in positive articles was over 9 (i.e., a mean of 9 more positive words than negative words), whilst in the specialist press the mean net sentiment in positive articles was nearly 8. In negative articles, the mean net sentiment overall and for broadsheets was just under -7.5, but in tabloids the mean net sentiment was under -8.5, and in the specialist press it was under -5. Hence, on average, positive articles showed a larger absolute net sentiment score than negative articles did.

As already noted, absolute sentiment values must be treated cautiously, with comparisons between source types perhaps more valid. Broadsheets were more positive than tabloids, rated both on words and on articles, whilst the specialist press was substantially more positive than either of these. Positive tabloid articles had the greatest standard deviation, indicating greater variability in sentiment scores. Moreover, negative tabloid articles showed a *more* negative mean score than articles in broadsheets or the specialist press did.

Table 7: Overall sentiment summaries

Note: Word summaries are based on the proportion of words assigned to each sentiment, whilst article summaries are based on the net balance of sentiment within each article. Mean sentiment refers to the mean net sentiment of articles assigned to that category; by definition, mean sentiment of neutral articles is 0.

Source type	Sentiment	No. assigned words	% assigned words	% total words	No. articles	% articles	Mean sentiment (± SD)
Overall	Negative	100,246	46.0%	4.85%	2,552	37.4%	-7.8 (± 8.74)
	Positive	117,578	54.0%	5.68%	3,954	58.0%	9.4 (± 9.84)
	Neutral	–	–	–	317	4.6%	–
Broadsheet	Negative	68,037	45.7%	4.79%	1,685	37.0%	-7.6 (± 8.48)
	Positive	80,775	54.3%	5.68%	2,673	58.7%	9.6 (± 9.50)
	Neutral	–	–	–	192	4.2%	–
Tabloid	Negative	27,178	47.5%	5.19%	702	40.3%	-8.7 (± 9.98)
	Positive	29,981	52.5%	5.72%	946	54.3%	9.4 (± 11.72)
	Neutral	–	–	–	93	5.3%	–
Specialist	Negative	5,031	42.4%	4.07%	165	31.0%	-5.2 (± 3.69)
	Positive	6,822	57.6%	5.52%	335	63.0%	7.9 (± 5.72)
	Neutral	–	–	–	32	6.0%	–

Topic models
Fifty topics were defined using LDA. The twenty words with the highest probability in each topic were used to infer topic meaning (see Table 8). Most were clearly identifiable, whilst some became clear after studying samples of articles assigned to them. However, some remained poorly defined: these are indicated with asterisks in Table 8. Some topics suggested a degree of over-differentiation (e.g., separate topics for "qualification reform (general)", "Gove reforms", and "reformed grades"), but even these could be interpreted coherently, suggesting that the LDA process successfully identified topics.

The relative occurrence of each topic is summarised in Table 9. When articles were assigned to the topics for which they had maximum probability, the largest topic overall was "results summaries" (Topic 10), with 4.6% of articles; this was also the largest topic for broadsheets (5.1% of articles). For tabloids, the largest topic was "personal results stories" (Topic 15; 6.0%), with "results summaries" and "tragedies & problems" (Topic 16) ranking joint second with 5.1%. Overall, the second largest topic was "grade boundaries & marking" (Topic 5; 3.7%), and the third was "the Diploma" (Topic 7; 3.5%). "Exam papers, questions & marking" (Topic 30) was fourth (3.3%), and "introduction of GCSEs" (Topic 45) was fifth (3.2%). Hence, overall and in broadsheets, coverage was dominated by the annual exams cycle and large-scale reforms. Tabloids, however, focused on personal stories about young people gaining results, and on problems and tragedies faced by GCSE candidates.

When all topic probabilities were simply summed across all articles, the largest topic was again "results summaries" (3.1%), but the second largest was "targets & results" (Topic 18; 2.9%), and the third was "grade boundaries & marking" (2.6%). Following these were "qualification reform" (Topic 28; 2.4%), and then "Gove reforms" (Topic 26), "league tables" (Topic 29), and "reformed grades" (Topic 40), all with 2.3%. The top topics in broadsheets were "results summaries" (3.1%), "grade boundaries & marking" (2.8%), and "targets & results" (2.7%). For tabloids, the top topics were "targets & results" (3.5%), "results summaries" (3.3%), and "personal results stories" (3.2%). In the specialist press, the top topics were "vocational qualifications" (Topic 19; 4.5%), "targets & results" (3.0%), and "school performance & improvement" (Topic 4; 3.0%). Therefore, results were the dominant theme underlying coverage, even if stories were ostensibly about other things. The coverage of results could occur both in the context of individuals (e.g., in "personal results stories") and of institutions (e.g., in "targets & results", or "school performance & improvement").

Table 8: The top 20 words and the interpreted meaning of the topics identified using latent Dirichlet allocation

Note: Topics for which the meaning was somewhat unclear are indicated with an asterisk. As in previous tables, words are given in their processed form, i.e., lowercase and lemmatised.

1: Ethnicity		2: Universities		3: Academies & school governance		4: School performance & improvement		5: Grade boundaries & marking	
Word	**Probability**	**Word**	**Probability**	**Word**	**Probability**	**Word**	**Probability**	**Word**	**Probability**
pupil	0.033	university	0.129	school	0.134	result	0.064	grade	0.077
white	0.029	student	0.041	academy	0.066	pupil	0.047	ofqual	0.036
group	0.029	alevel	0.041	specialist	0.017	school	0.045	exam	0.034
british	0.025	place	0.032	include	0.015	score	0.040	english	0.033
country	0.023	degree	0.021	government	0.015	gcse	0.037	boundary	0.021
london	0.022	course	0.018	result	0.014	point	0.035	mark	0.021
child	0.019	oxford	0.016	pupil	0.014	performance	0.034	regulator	0.015
black	0.017	high	0.015	gcse	0.012	average	0.026	change	0.015
education	0.016	admission	0.015	trust	0.011	add	0.023	board	0.015
britain	0.016	cambridge	0.014	new	0.010	progress	0.022	result	0.014
high	0.015	offer	0.013	improve	0.010	measure	0.020	summer	0.013
ethnic	0.014	apply	0.012	secondary	0.010	compare	0.018	january	0.012
english	0.012	grade	0.011	fail	0.010	grade	0.018	june	0.011
minority	0.012	study	0.011	year	0.010	achieve	0.017	student	0.009
gcse	0.011	a	0.010	good	0.010	better	0.016	award	0.009
uk	0.011	applicant	0.009	college	0.009	data	0.014	stacey	0.008
work	0.010	application	0.009	state	0.009	make	0.012	raise	0.008
east	0.009	up	0.008	achieve	0.009	show	0.012	year	0.008
make	0.009	year	0.008	sponsor	0.009	perform	0.011	gcse	0.008
chinese	0.009	clear	0.008	challenge	0.008	high	0.011	pupil	0.007

Table 8 (continued): The top 20 words and the interpreted meaning of the topics identified using latent Dirichlet allocation

6: Employment & the workplace		7: The Diploma		8: A levels & post-16 education		9: Problems at school		10: Results summaries	
Word	**Probability**	**Word**	**Probability**	**Word**	**Probability**	**Word**	**Probability**	**Word**	**Probability**
people	0.076	diploma	0.043	student	0.141	school	0.064	year	0.075
young	0.062	alevel	0.039	alevel	0.138	pupil	0.014	grade	0.056
education	0.032	system	0.024	college	0.076	tell	0.014	result	0.050
work	0.030	qualification	0.021	year	0.042	call	0.013	percent	0.044
skill	0.024	government	0.020	sixth	0.041	head	0.012	astar	0.040
job	0.023	education	0.018	form	0.040	staff	0.011	number	0.039
train	0.021	tomlinson	0.017	level	0.033	day	0.010	entry	0.037
learn	0.017	14	0.015	study	0.027	miss	0.010	rise	0.032
life	0.013	vocational	0.015	course	0.020	make	0.008	fall	0.027
employer	0.013	academic	0.015	far	0.012	parent	0.007	increase	0.027
career	0.012	new	0.014	subject	0.011	primary	0.007	drop	0.019
business	0.010	minister	0.012	make	0.010	letter	0.007	percentage	0.018
apprenticeship	0.010	proposal	0.012	choose	0.009	case	0.007	down	0.018
qualification	0.009	gcse	0.012	time	0.009	teacher	0.007	english	0.017
opportunity	0.009	replace	0.011	continue	0.007	issue	0.007	proportion	0.016
high	0.009	level	0.011	high	0.007	police	0.006	up	0.016
future	0.009	reform	0.011	find	0.006	rule	0.006	point	0.016
important	0.009	mike	0.011	choice	0.006	week	0.006	pass	0.015
time	0.009	report	0.010	place	0.006	month	0.006	show	0.014
develop	0.008	plan	0.010	former	0.006	receive	0.006	rate	0.013

Table 8 (continued): The top 20 words and the interpreted meaning of the topics identified using latent Dirichlet allocation

11: GCSE entries		12: Core skills		13: Revision & miscellaneous time use*		14: Personal perspectives		15: Personal results stories	
Word	**Probability**	**Word**	**Probability**	**Word**	**Probability**	**Word**	**Probability**	**Word**	**Probability**
exam	0.184	maths	0.147	hour	0.031	dont	0.029	year	0.029
pupil	0.114	english	0.041	time	0.031	thing	0.024	grade	0.027
gcse	0.101	skill	0.041	up	0.025	work	0.023	gcse	0.025
sit	0.064	gcse	0.034	week	0.024	up	0.019	astar	0.025
year	0.048	basic	0.030	day	0.022	make	0.018	maths	0.020
early	0.038	standard	0.023	exam	0.021	good	0.015	old	0.018
student	0.027	literacy	0.019	work	0.020	im	0.015	pass	0.018
enter	0.018	mathematics	0.018	revision	0.017	people	0.015	16	0.016
time	0.018	test	0.016	spend	0.016	lot	0.014	a	0.016
test	0.017	numeracy	0.016	course	0.015	feel	0.014	college	0.015
take	0.016	level	0.015	gcse	0.012	think	0.013	achieve	0.015
summer	0.014	fail	0.014	tutor	0.012	kid	0.012	result	0.014
end	0.009	pass	0.012	study	0.012	hard	0.011	study	0.012
multiple	0.009	employer	0.011	minute	0.011	didnt	0.011	young	0.012
bright	0.008	government	0.011	start	0.010	start	0.010	star	0.010
maths	0.007	subject	0.010	class	0.010	time	0.009	gain	0.010
15	0.007	problem	0.009	extra	0.010	day	0.009	yesterday	0.010
attempt	0.007	good	0.009	teenager	0.008	job	0.009	exam	0.009
number	0.007	improve	0.007	year	0.008	give	0.009	celebrate	0.009
resits	0.007	make	0.007	revise	0.008	ive	0.009	hard	0.008

(continued on next page)

Table 8 (continued): The top 20 words and the interpreted meaning of the topics identified using latent Dirichlet allocation

16: Tragedies & problems		17: Exam boards & regulation		18: Targets & results		19: Vocational qualifications		20: Poor results*	
Word	Probability	Word	Probability	Word	Probability	Word	Probability	Word	Probability
family	0.014	exam	0.094	percent	0.190	course	0.075	result	0.110
mother	0.010	board	0.083	pupil	0.057	qualification	0.069	year	0.047
home	0.010	ocr	0.018	pass	0.044	vocational	0.055	gcse	0.044
friend	0.010	edexcel	0.016	show	0.039	gcse	0.050	school	0.043
old	0.010	qualification	0.016	grade	0.039	offer	0.020	education	0.020
life	0.009	question	0.016	figure	0.037	equivalent	0.020	day	0.019
day	0.009	chief	0.016	gcse	0.036	academic	0.018	time	0.017
tell	0.009	examiner	0.015	year	0.030	level	0.017	week	0.013
year	0.006	standard	0.014	gain	0.026	subject	0.013	receive	0.013
find	0.006	aqa	0.013	achieve	0.024	gnvq	0.011	release	0.012
father	0.006	executive	0.012	good	0.018	worth	0.011	publish	0.012
house	0.006	body	0.011	rise	0.016	work	0.010	write	0.010
think	0.006	tell	0.011	government	0.016	option	0.010	claim	0.010
leave	0.005	ofqual	0.011	less	0.016	technology	0.009	august	0.010
live	0.005	system	0.010	fail	0.015	new	0.009	department	0.009
manchester	0.005	easy	0.009	target	0.013	design	0.008	thursday	0.008
time	0.005	spokesman	0.009	half	0.013	skill	0.008	david	0.008
sit	0.005	teacher	0.009	rate	0.013	national	0.008	up	0.008
back	0.005	regulator	0.008	minister	0.012	btec	0.008	news	0.007
night	0.005	alevel	0.008	astar	0.012	business	0.007	show	0.006

Table 8 (continued): The top 20 words and the interpreted meaning of the topics identified using latent Dirichlet allocation

21: Religion & religious education		22: Curriculum & syllabus content		23: Teaching		24: Coursework & assessment methods		25: Criticism of the education system	
Word	Probability	Word	Probability	Word	Probability	Word	Probability	Word	Probability
gcse	0.034	curriculum	0.082	teacher	0.188	coursework	0.082	education	0.022
study	0.034	test	0.060	teach	0.099	teacher	0.054	system	0.016
religious	0.025	national	0.053	school	0.051	exam	0.054	long	0.011
education	0.021	key	0.029	pupil	0.035	assessment	0.047	fact	0.009
teach	0.021	stage	0.027	lesson	0.024	work	0.027	a	0.008
view	0.016	level	0.023	year	0.023	gcse	0.027	problem	0.008
school	0.014	assessment	0.018	head	0.016	mark	0.021	academic	0.008
include	0.014	new	0.016	train	0.015	assess	0.018	educational	0.008
make	0.011	subject	0.014	staff	0.013	write	0.017	failure	0.008
curriculum	0.011	change	0.009	classroom	0.013	final	0.014	world	0.008
campaign	0.010	10	0.009	work	0.012	report	0.014	make	0.008
faith	0.009	authority	0.008	class	0.012	control	0.012	public	0.007
belief	0.009	attainment	0.007	up	0.010	pupil	0.012	real	0.007
new	0.008	base	0.007	experience	0.009	test	0.011	fail	0.007
decision	0.008	provide	0.007	primary	0.009	cheat	0.010	standard	0.006
religion	0.008	part	0.007	make	0.009	essay	0.008	country	0.006
morgan	0.008	review	0.007	secondary	0.009	subject	0.008	mean	0.006
people	0.007	14	0.007	find	0.008	up	0.008	government	0.006
government	0.007	target	0.006	time	0.008	speak	0.008	political	0.006
pupil	0.007	set	0.006	qualify	0.008	complete	0.007	matter	0.006

Table 8 (continued): The top 20 words and the interpreted meaning of the topics identified using latent Dirichlet allocation

26: Gove reforms		27: Independent schools		28: Qualification reforms (general)		29: League tables		30: Exam papers, questions & marking	
Word	**Probability**	**Word**	**Probability**	**Word**	**Probability**	**Word**	**Probability**	**Word**	**Probability**
gove	0.063	school	0.148	new	0.064	school	0.131	paper	0.101
education	0.037	independent	0.059	change	0.061	table	0.096	mark	0.101
michael	0.024	state	0.050	exam	0.054	league	0.068	exam	0.082
secretary	0.024	gcse	0.045	reform	0.036	pupil	0.063	question	0.042
labour	0.022	private	0.031	system	0.029	include	0.021	candidate	0.024
plan	0.022	international	0.026	qualification	0.028	gcse	0.020	examiner	0.023
system	0.021	exam	0.024	gcse	0.025	measure	0.019	board	0.021
minister	0.018	offer	0.020	course	0.020	performance	0.019	answer	0.015
exam	0.015	igcse	0.018	end	0.020	government	0.019	appeal	0.014
reform	0.013	sector	0.014	introduce	0.017	english	0.015	error	0.013
olevel	0.013	headmaster	0.013	make	0.014	number	0.015	student	0.012
down	0.011	igcses	0.012	september	0.013	secondary	0.013	script	0.011
mp	0.010	head	0.012	plan	0.012	count	0.012	gcse	0.010
government	0.010	lead	0.011	time	0.011	publish	0.012	mistake	0.009
scrap	0.009	pupil	0.011	current	0.011	enter	0.009	marker	0.008
conservative	0.009	qualification	0.010	modular	0.011	rank	0.009	number	0.007
replace	0.009	alternative	0.009	module	0.010	position	0.009	alevel	0.007
tory	0.009	favour	0.008	move	0.009	target	0.008	quality	0.007
back	0.008	dr	0.008	long	0.008	boost	0.008	wrong	0.007
new	0.008	conference	0.008	content	0.008	maths	0.008	summer	0.007

Table 8 (continued): The top 20 words and the interpreted meaning of the topics identified using latent Dirichlet allocation

31: Parental involvement & families		32: Subject choice		33: Gender		34: Inspections		35: Learning methods & technology	
Word	Probability	Word	Probability	Word	Probability	Word	Probability	Word	Probability
child	0.172	subject	0.167	boy	0.133	school	0.089	student	0.034
parent	0.086	english	0.056	girl	0.121	ofsted	0.024	computer	0.019
school	0.059	history	0.045	gap	0.030	year	0.022	book	0.015
home	0.019	study	0.035	school	0.025	authority	0.021	work	0.014
daughter	0.013	geography	0.033	better	0.021	education	0.019	learn	0.013
education	0.012	gcse	0.029	sex	0.017	local	0.019	guide	0.012
childrens	0.012	art	0.027	gender	0.015	improve	0.016	information	0.012
son	0.011	maths	0.025	year	0.014	standard	0.013	question	0.011
year	0.011	pupil	0.022	single	0.012	inspector	0.012	answer	0.010
class	0.011	science	0.022	performance	0.011	good	0.012	teacher	0.008
time	0.011	core	0.021	ahead	0.010	head	0.012	write	0.008
family	0.010	academic	0.019	time	0.010	target	0.012	online	0.008
care	0.010	language	0.019	male	0.010	pupil	0.011	revision	0.007
good	0.010	baccalaureate	0.018	woman	0.009	city	0.011	include	0.007
age	0.009	ebacc	0.018	percent	0.009	improvement	0.011	material	0.007
learn	0.008	design	0.012	gcse	0.008	fail	0.010	website	0.007
start	0.008	technology	0.011	show	0.008	result	0.009	resource	0.006
up	0.008	traditional	0.011	compare	0.008	close	0.009	gcse	0.006
primary	0.008	curriculum	0.010	point	0.007	secondary	0.009	offer	0.006
read	0.007	humanity	0.010	result	0.007	inspection	0.008	page	0.006

Table 8 (continued): The top 20 words and the interpreted meaning of the topics identified using latent Dirichlet allocation

36: Money & finances		37: Practical skills, media & social media*		38: Countries of the UK		39: Research reports		40: Reformed grades	
Word	**Probability**	**Word**	**Probability**	**Word**	**Probability**	**Word**	**Probability**	**Word**	**Probability**
pay	0.031	music	0.019	gcse	0.091	report	0.057	grade	0.160
pound	0.031	food	0.011	england	0.084	research	0.050	new	0.046
money	0.022	life	0.010	wales	0.042	find	0.044	gcse	0.035
spend	0.019	home	0.007	education	0.039	study	0.031	system	0.033
fund	0.019	cook	0.007	pupil	0.036	gcse	0.029	student	0.028
cost	0.018	make	0.007	northern	0.027	professor	0.028	astar	0.025
year	0.017	drink	0.007	welsh	0.024	education	0.018	top	0.024
up	0.013	gcse	0.007	ireland	0.023	suggest	0.017	high	0.020
government	0.012	learn	0.006	government	0.017	university	0.017	year	0.020
scheme	0.011	play	0.006	minister	0.013	little	0.015	9	0.019
million	0.011	dance	0.006	high	0.012	survey	0.014	achieve	0.018
extra	0.010	film	0.006	country	0.012	academic	0.014	english	0.017
month	0.009	world	0.005	up	0.011	better	0.012	maths	0.017
financial	0.009	art	0.005	week	0.010	researcher	0.012	1	0.016
service	0.008	eat	0.005	year	0.010	finding	0.012	pass	0.016
cut	0.008	new	0.005	move	0.010	evidence	0.011	4	0.011
new	0.007	write	0.005	today	0.010	improve	0.011	award	0.011
increase	0.007	call	0.005	qualification	0.009	lead	0.011	low	0.011
company	0.007	club	0.005	english	0.009	effect	0.011	mark	0.010
fee	0.007	live	0.005	continue	0.007	dr	0.010	result	0.009

Table 8 (continued): The top 20 words and the interpreted meaning of the topics identified using latent Dirichlet allocation

41: Science		42: Teaching unions		43: History		44: Profiles of schools, courses & initiatives*		45: Introduction of GCSEs	
Word	**Probability**	**Word**	**Probability**	**Word**	**Probability**	**Word**	**Probability**	**Word**	**Probability**
science	0.173	secretary	0.062	history	0.036	school	0.103	gcse	0.048
gcse	0.055	association	0.052	question	0.028	year	0.029	standard	0.047
physic	0.043	teacher	0.051	understand	0.017	pupil	0.019	exam	0.046
subject	0.038	general	0.046	syllabus	0.014	work	0.016	examine	0.026
chemistry	0.035	head	0.046	answer	0.014	learn	0.014	group	0.024
biology	0.030	government	0.038	knowledge	0.013	sport	0.011	olevel	0.023
study	0.024	national	0.036	make	0.012	group	0.010	council	0.022
pupil	0.019	gcse	0.034	different	0.008	offer	0.010	board	0.021
separate	0.016	education	0.030	show	0.008	set	0.009	candidate	0.016
course	0.015	leader	0.028	study	0.008	parent	0.009	year	0.015
double	0.013	union	0.026	1	0.008	project	0.009	syllabus	0.014
up	0.012	yesterday	0.021	skill	0.007	community	0.008	education	0.014
alevel	0.010	john	0.017	world	0.007	open	0.008	report	0.010
new	0.009	call	0.015	course	0.007	up	0.007	yesterday	0.009
practical	0.009	warn	0.014	part	0.007	centre	0.007	secretary	0.009
award	0.009	minister	0.013	write	0.007	local	0.007	john	0.008
scientific	0.009	add	0.012	2	0.006	teach	0.007	inspector	0.008
take	0.008	david	0.012	topic	0.006	part	0.006	maintain	0.008
single	0.008	secondary	0.011	source	0.006	build	0.006	baker	0.007
number	0.008	dunford	0.009	design	0.006	head	0.006	government	0.007

Table 8 (continued): The top 20 words and the interpreted meaning of the topics identified using latent Dirichlet allocation

46: Leaving school & exams at 16*		47: Languages		48: Disadvantage & socioeconomics		49: English		50: School comparisons	
Word	Probability	Word	Probability	Word	Probability	Word	Probability	Word	Probability
year	0.116	language	0.156	school	0.108	english	0.077	school	0.147
16	0.093	french	0.033	child	0.051	literature	0.035	top	0.034
old	0.090	german	0.024	pupil	0.049	read	0.028	grammar	0.027
age	0.073	foreign	0.024	poor	0.030	write	0.025	high	0.026
education	0.053	learn	0.021	area	0.021	spell	0.022	girl	0.022
14	0.038	study	0.021	comprehensive	0.018	gcse	0.019	london	0.021
leave	0.034	modern	0.021	grammar	0.017	study	0.016	st	0.018
school	0.027	school	0.020	free	0.017	text	0.016	comprehensive	0.014
11	0.026	gcse	0.018	disadvantage	0.016	include	0.014	astar	0.014
18	0.025	number	0.015	class	0.016	new	0.012	state	0.013
gcse	0.020	spanish	0.015	secondary	0.015	play	0.012	table	0.012
youngster	0.017	year	0.014	low	0.013	pupil	0.012	gcse	0.012
up	0.014	take	0.013	good	0.012	book	0.011	independent	0.011
stay	0.013	subject	0.013	meal	0.012	exam	0.010	college	0.010
teenager	0.011	speak	0.012	social	0.011	syllabus	0.010	king	0.010
15	0.010	decline	0.012	achieve	0.011	grammar	0.010	10	0.010
17	0.010	teach	0.012	background	0.011	shakespeare	0.010	best	0.010
young	0.010	latin	0.011	gap	0.010	punctuation	0.009	grade	0.010
end	0.010	make	0.011	state	0.010	word	0.009	result	0.009
start	0.009	compulsory	0.010	education	0.010	author	0.008	place	0.009

Table 9: The percentage of articles and the percentage of probability assigned to each topic

Note: For the percentage of articles, each article was assigned to the topic for which it had the largest probability; if multiple topics showed equally high probability the article was divided equally between them. For the percentage of probability, the probability of each topic was simply summed across all articles. Topics for which the interpretation was unclear are indicated with asterisks. The table is sorted by the overall percentage of probability (highlighted in bold).

Topic	Overall		Broadsheet		Tabloid		Specialist	
	% articles	% prob.	% articles	% prob.	% articles	% prob.	% articles	% prob.
10. Results summaries	4.59%	**3.10%**	4.62%	3.11%	5.13%	3.25%	2.50%	2.57%
18. Targets & results	2.71%	**2.89%**	2.47%	2.65%	3.41%	3.45%	2.43%	3.03%
5. Grade boundaries & marking	3.73%	**2.60%**	4.36%	2.82%	2.67%	2.23%	1.87%	1.92%
28. Qualification reforms (general)	2.14%	**2.37%**	2.23%	2.40%	1.86%	2.12%	2.25%	2.98%
26. Gove reforms	2.84%	**2.33%**	2.92%	2.38%	3.24%	2.46%	0.84%	1.49%
29. League tables	2.75%	**2.30%**	2.82%	2.33%	2.31%	2.07%	3.56%	2.77%
40. Reformed grades	2.55%	**2.28%**	2.34%	2.19%	3.36%	2.66%	1.69%	1.89%
14. Personal perspectives	1.90%	**2.26%**	2.09%	2.28%	1.76%	2.41%	0.75%	1.61%
11. GCSE entries	1.18%	**2.24%**	1.10%	2.17%	1.23%	2.47%	1.69%	2.12%
4. School performance & improvement	1.87%	**2.20%**	1.93%	2.27%	0.86%	1.80%	4.65%	2.99%
7. The Diploma	3.53%	**2.19%**	3.55%	2.20%	3.64%	2.10%	3.00%	2.43%
50. School comparisons	2.81%	**2.18%**	2.78%	2.14%	3.50%	2.50%	0.81%	1.53%
27. Independent schools	2.95%	**2.16%**	3.04%	2.27%	2.73%	1.98%	2.90%	1.75%
19. Vocational qualifications	2.90%	**2.15%**	2.29%	2.03%	2.07%	1.73%	10.86%	4.52%
30. Exam papers, questions & marking	3.26%	**2.12%**	3.32%	2.10%	3.50%	2.28%	1.97%	1.75%
6. Employment & the workplace	1.81%	**2.11%**	1.93%	2.19%	1.20%	1.88%	2.81%	2.19%
45. Introduction of GCSEs	3.19%	**2.11%**	4.28%	2.43%	1.32%	1.48%	0.00%	1.40%
12. Core skills	2.59%	**2.10%**	2.31%	2.00%	2.94%	2.27%	3.84%	2.44%
17. Exam boards & regulation	2.24%	**2.10%**	2.29%	2.12%	1.62%	1.86%	3.75%	2.74%
32. Subject choice	2.21%	**2.10%**	2.39%	2.19%	1.84%	1.88%	1.87%	2.10%
48. Disadvantage & socioeconomics	2.06%	**2.09%**	2.03%	2.08%	2.44%	2.20%	1.12%	1.75%
46. Leaving school & exams at 16*	0.81%	**2.02%**	0.74%	2.01%	0.89%	2.10%	1.22%	1.84%
15. Personal results stories	3.00%	**2.01%**	2.16%	1.66%	6.01%	3.20%	0.37%	1.11%
25. Criticism of the education system	1.86%	**1.99%**	1.98%	2.12%	1.86%	1.78%	0.81%	1.62%
34. Inspections	2.04%	**1.99%**	1.93%	1.98%	2.09%	1.93%	2.78%	2.20%

(continued on next page)

	Topic	Overall		Broadsheet		Tabloid		Specialist	
		% articles	% prob.	% articles	% prob.	% articles	% prob.	% articles	% prob.
3.	Academies & school governance	2.50%	**1.98%**	2.98%	2.09%	1.29%	1.64%	2.34%	2.16%
47.	Languages	3.18%	**1.97%**	3.53%	2.04%	2.11%	1.66%	3.75%	2.32%
42.	Teaching unions	0.61%	**1.96%**	0.75%	1.99%	0.34%	1.85%	0.28%	2.03%
8.	A levels & post-16 education	0.78%	**1.94%**	0.91%	2.02%	0.29%	1.65%	1.31%	2.24%
22.	Curriculum & syllabus content	1.40%	**1.94%**	1.80%	2.11%	0.09%	1.19%	2.25%	2.94%
39.	Research reports	0.89%	**1.92%**	0.78%	1.87%	0.89%	1.87%	1.87%	2.58%
24.	Coursework & assessment methods	1.84%	**1.89%**	1.76%	1.91%	1.55%	1.68%	3.46%	2.39%
16.	Tragedies & problems	2.28%	**1.88%**	1.46%	1.53%	5.05%	3.08%	0.25%	0.93%
31.	Parental involvement & families	1.33%	**1.82%**	1.52%	1.87%	0.98%	1.86%	0.94%	1.25%
23.	Teaching	0.66%	**1.81%**	0.67%	1.83%	0.56%	1.70%	0.84%	2.04%
2.	Universities	1.48%	**1.80%**	1.54%	1.88%	1.78%	1.76%	0.00%	1.23%
43.	History	1.71%	**1.77%**	1.79%	1.84%	1.58%	1.61%	1.50%	1.73%
44.	Profiles of schools, courses & initiatives*	1.26%	**1.77%**	1.58%	1.90%	0.55%	1.45%	0.84%	1.64%
49.	English	2.38%	**1.76%**	2.32%	1.73%	2.70%	1.94%	1.87%	1.50%
36.	Money & finances	1.22%	**1.71%**	1.10%	1.69%	1.61%	1.77%	0.94%	1.69%
41.	Science	1.63%	**1.69%**	1.68%	1.68%	0.75%	1.47%	4.12%	2.41%
13.	Revision & miscellaneous time use*	1.52%	**1.67%**	1.57%	1.67%	1.57%	1.74%	0.84%	1.39%
9.	Problems at school	1.32%	**1.65%**	0.91%	1.51%	2.70%	2.15%	0.37%	1.26%
20.	Poor results*	0.54%	**1.64%**	0.38%	1.59%	1.03%	1.80%	0.28%	1.51%
33.	Gender	1.74%	**1.64%**	1.70%	1.56%	2.18%	1.98%	0.66%	1.16%
35.	Learning methods & technology	1.31%	**1.63%**	1.17%	1.61%	0.99%	1.46%	3.56%	2.34%
37.	Practical skills, media & social media*	1.70%	**1.54%**	1.33%	1.38%	2.93%	2.07%	0.84%	1.13%
38.	Countries of the UK	0.77%	**1.54%**	0.54%	1.51%	0.40%	1.41%	3.93%	2.28%
21.	Religion & religious education	1.03%	**1.53%**	1.06%	1.55%	0.80%	1.39%	1.50%	1.85%
1.	Ethnicity	1.39%	**1.52%**	1.26%	1.49%	1.81%	1.69%	1.12%	1.25%

To investigate the sentiment associated with each topic, articles were assigned to the topic for which they had the maximum probability, and then the means and standard deviations of article sentiment scores were calculated for each topic (see Table 10 and Figure 4). As with the main sentiment analysis, caution must be applied in interpreting the results.

The most positive sentiment scores came from "school comparisons" (Topic 50), "personal results stories" (Topic 15), and "profiles of schools, courses & initiatives" (Topic 44). Articles in these topics typically described people or schools that had performed well, or were an opportunity to promote something. Such articles might single out examples of good practice or good results. More broadly, many topics in which results were presented showed net positive sentiments; this may be linked to the language inherent in such reporting (e.g., "achievement", "award", and "gain"), but may also imply that getting good results is described positively, despite any discussions about standards.

The most negative sentiment scores came from "problems at school" (Topic 9), "grade boundaries & marking" (Topic 5), and "exam papers, questions & marking" (Topic 30). "Problems at school" would be expected to be negative, as articles focused on incidents such as criminal actions, public arguments and cheating. However, the other two topics were related to exams. Indeed, "exam boards & regulation" (Topic 17) and "coursework & assessment methods" (Topic 24) also had net negative scores; no topic related to the administration of exams had net positive sentiment. Interestingly, "grade boundaries & marking" particularly focused on the 2012 GCSE English results, in which the percentage of candidates gaining a C or above declined[13]. Hence, the most negative topic was linked to falling grades. A further theme was that of qualification reform, with "introduction of GCSEs" (Topic 45), "Gove reforms" (Topic 26) and "qualifications reform (general)" (Topic 28) all being negative. This could be because of the way reforms are presented as fixing problems in the status quo (thus necessitating negative language), or could be because the reforms themselves were received critically.

Standard deviations were calculated to indicate which topics had the most variable sentiment. These were "countries of the UK" (Topic 38), "teaching unions" (Topic 42), and "exam papers, questions & marking" (Topic 30). Variable sentiment could be due to the topics containing a broad range of issues (e.g., "countries of the UK"), or because they were portrayed differently by different sources (e.g., "teaching unions"). The reason behind variability in "exam papers, questions & marking" is less clear, but one possibility is that it reflects the types of stories that make the news: exam papers and questions might make the news if they contain an error, but light-hearted articles might cover questions that produced amusing student responses on social media.

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[13] For further information on the events around the awarding of GCSE English in 2012, see House of Commons Education Committee. (2013). *2012 GCSE English results*. https://publications.parliament.uk/pa/cm201314/cmselect/cmeduc/204/204.pdf, accessed August 6, 2018.

Table 10: The mean and standard deviation of sentiment scores for articles assigned to each topic

Note: Articles were assigned to the topic for which they had highest probability; the mean and standard deviation of sentiment scores across all articles within each topic were then calculated. Sentiment scores were the net sentiment, divided by the number of words assigned with any sentiment. Topics are sorted by sentiment, from most positive to most negative. Topics with unclear interpretations are indicated with asterisks.

Topic	Meaning	Mean sentiment ± SD
50.	School comparisons	0.45 ± 0.322
15.	Personal results stories	0.37 ± 0.319
44.	Profiles of schools, courses & initiatives*	0.37 ± 0.307
4.	School performance & improvement	0.33 ± 0.351
6.	Employment & the workplace	0.33 ± 0.328
19.	Vocational qualifications	0.31 ± 0.336
33.	Gender	0.26 ± 0.277
35.	Learning methods & technology	0.26 ± 0.322
27.	Independent schools	0.24 ± 0.356
1.	Ethnicity	0.23 ± 0.361
3.	Academies & school governance	0.21 ± 0.287
39.	Research reports	0.18 ± 0.376
18.	Targets & results	0.17 ± 0.345
2.	Universities	0.16 ± 0.309
32.	Subject choice	0.16 ± 0.320
40.	Reformed grades	0.16 ± 0.312
8.	A levels & post-16 education	0.14 ± 0.385
29.	League tables	0.14 ± 0.325
10.	Results summaries	0.13 ± 0.329
36.	Money & finances	0.12 ± 0.351
38.	Countries of the UK	0.12 ± 0.444
48.	Disadvantage & socioeconomics	0.12 ± 0.260
7.	The Diploma	0.11 ± 0.284
12.	Core skills	0.11 ± 0.305
13.	Revision & miscellaneous time use*	0.11 ± 0.285
22.	Curriculum & syllabus content	0.10 ± 0.318
37.	Practical skills, media & social media*	0.10 ± 0.380
47.	Languages	0.10 ± 0.343
11.	GCSE entries	0.08 ± 0.341
31.	Parental involvement & families	0.08 ± 0.282
46.	Leaving school & exams at 16*	0.08 ± 0.356
43.	History	0.07 ± 0.323
34.	Inspections	0.06 ± 0.293
14.	Personal perspectives	0.05 ± 0.282
21.	Religion & religious education	0.04 ± 0.383
23.	Teaching	0.03 ± 0.338
41.	Science	0.03 ± 0.285
49.	English	0.00 ± 0.353
28.	Qualification reforms (general)	-0.03 ± 0.352
17.	Exam boards & regulation	-0.04 ± 0.277
25.	Criticism of the education system	-0.04 ± 0.236
42.	Teaching unions	-0.06 ± 0.416
45.	Introduction of GCSEs	-0.06 ± 0.321
26.	Gove reforms	-0.08 ± 0.285
24.	Coursework & assessment methods	-0.09 ± 0.332
16.	Tragedies & problems	-0.13 ± 0.324
20.	Poor results*	-0.14 ± 0.263
30.	Exam papers, questions & marking	-0.17 ± 0.391
5.	Grade boundaries & marking	-0.21 ± 0.288
9.	Problems at school	-0.36 ± 0.326
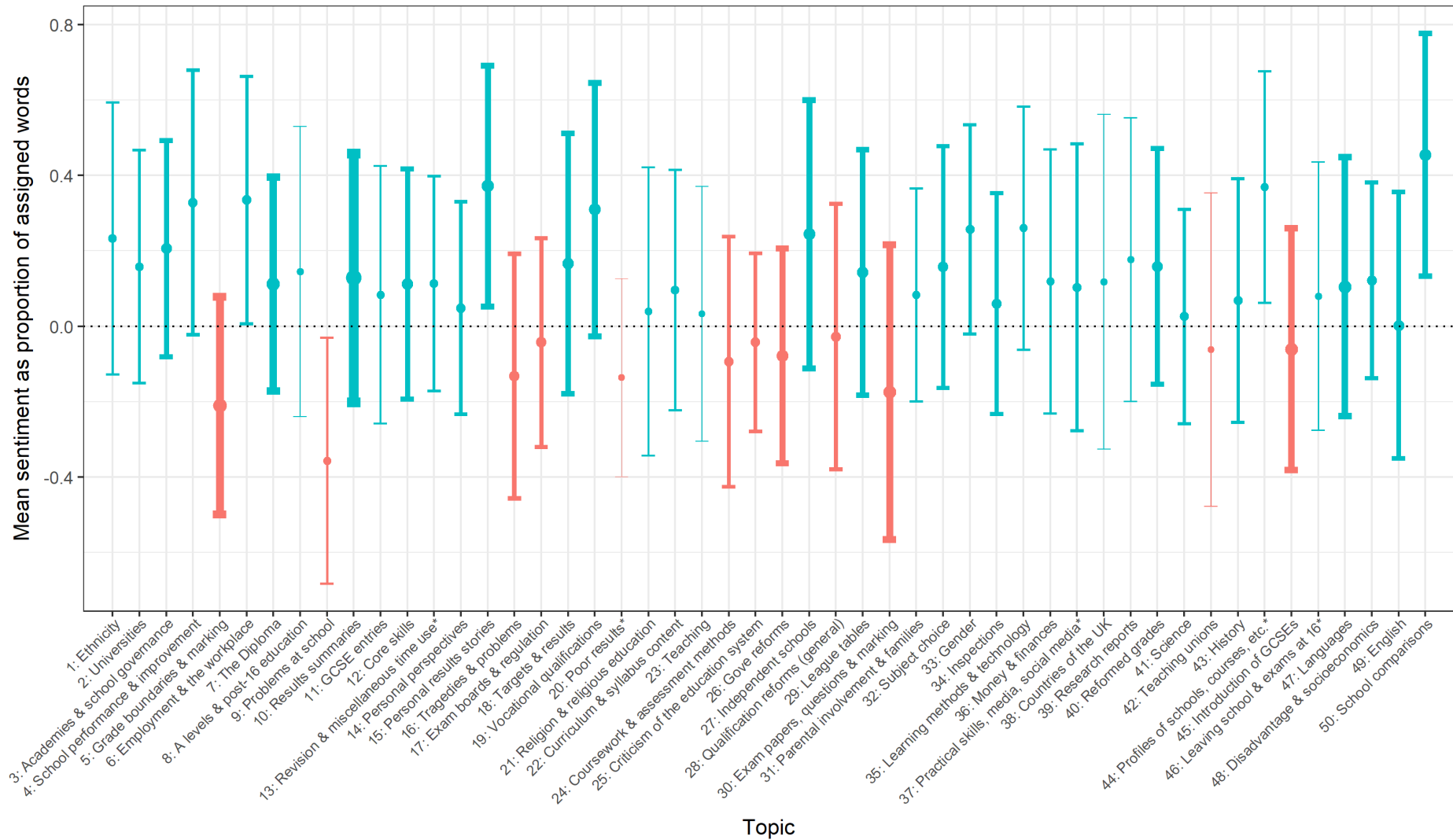
Figure 4: The mean sentiment (± 1 standard deviation) of articles assigned to each topic

Note: Values are calculated as described in Table 10. Red bars indicate net negative sentiment; blue bars indicate net positive sentiment. Width of points and error bars is proportional to the number of articles in that topic, such that thicker bars are larger topics. Dotted line at 0 indicates neutral net sentiment.

Article and word frequencies over time

The corpus contained more articles from recent years (see Table 11), with more articles in the third decade than in the first two combined. However, the specialist press had more articles from the second decade. Due to the changing composition of the corpus, it is unclear to what extent the increasing number of articles reflects a genuine increase in coverage, but when sources were analysed separately (results not shown), all showed an increase over time, suggesting that the trend is real. The distribution of articles over all months of all years is shown in Figure 5.

Table 11: Distribution of articles over decades of the sample

Decade	Overall	Broadsheet	Tabloid	Specialist
1988–1997	894	768	126	0
1998–2007	2,137	1,222	591	324
2008–2017	3,800	2,564	1,026	210
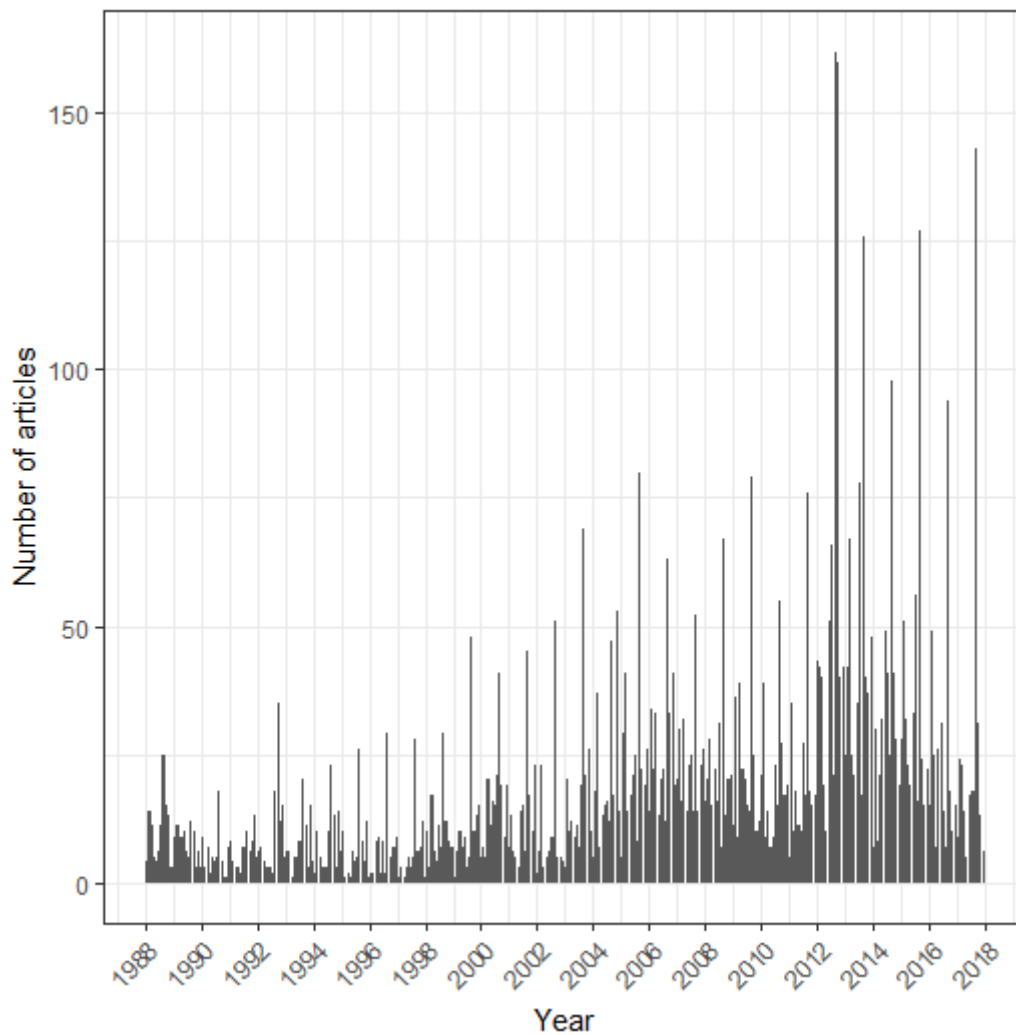
Figure 5: Article frequencies for each month of each year in the corpus

Figure 5 also shows strong peaks, reflecting an uneven distribution of articles within years. This was confirmed when article frequencies within months (across all years) were calculated (see Table 12). Peaks corresponded to August, which contained many more articles than any other month: this is to be expected, as GCSE results are released in August.

Table 12: Distribution of articles over months of the sample

Month	Overall	Broadsheet	Tabloid	Specialist
January	593	407	136	50
February	481	327	104	50
March	399	271	77	51
April	316	201	78	37
May	455	276	135	44
June	569	361	155	53
July	330	212	89	29
August	1,761	1,180	510	71
September	680	462	173	45
October	473	322	106	45
November	482	323	128	31
December	292	212	52	28

The most frequently occurring words showed remarkable consistency across decades (see Table 13). Some changes were evident, however. In the first decade, "national", "curriculum", "standard", and "board" occurred, reflecting the introduction of GCSEs and the National Curriculum. By the third decade, these words were no longer evident, but "Astar" and "university" had come in, showing the impact of changes over the previous decades (i.e., introduction of A*, and increasing focus on attending university). A notable trend was that the position of "teacher" declined each decade, moving from 8th to 11th to 14th. Conversely, "pupil" remained in the top 10, "child" moved from 23rd to 13th to 16th, whilst student moved from 18th to 9th to 7th. This suggests that the focus of coverage might have shifted away from teachers towards students. Word clouds suggested a broadly similar vocabulary was used in each decade (see Figure 6).

There were few clear patterns in the most frequent words used each month (see Appendix Table A1 and Figure A7), with "school", "GCSE", "year", "exam", and "pupil" usually forming the top five words, albeit with some changes to their order. However, in August and September, "grade" moved into the top 5, reflecting the release of results. August word counts were much higher than those in all other months, meaning that overall patterns were strongly influenced by whatever was written in August.

Table 13: Top 30 most frequent words in each decade of the corpus

1988–1997		1998–2007		2008–2017	
word	count	word	count	word	count
school	6,216	school	17,576	school	28,221
gcse	5,016	gcse	12,038	gcse	21,153
year	3,594	year	9,085	exam	16,816
exam	3,522	pupil	8,088	year	15,653
pupil	2,927	exam	6,563	pupil	14,748
grade	2,376	education	5,281	grade	14,055
education	2,191	grade	5,272	student	8,938
teacher	2,098	percent	4,518	english	8,703
percent	2,056	student	4,075	education	8,619
subject	1,804	result	3,971	result	8,090
result	1,650	teacher	3,903	subject	7,583
alevel	1,641	alevel	3,715	percent	7,509
course	1,587	child	3,501	maths	6,896
national	1,435	up	3,324	teacher	6,562
work	1,427	subject	3,290	new	6,240
standard	1,320	maths	3,029	child	5,918
science	1,298	government	3,005	up	5,686
student	1,277	study	2,914	make	5,315
up	1,227	work	2,882	alevel	5,314
english	1,222	new	2,879	study	5,017
curriculum	1,194	english	2,851	qualification	4,656
make	1,190	make	2,720	astar	4,593
study	1,127	qualification	2,714	system	4,590
new	1,122	pass	2,602	number	4,504
child	1,109	course	2,379	language	4,429
board	1,036	high	2,363	high	4,283
time	1,036	time	2,310	time	4,269
high	1,001	language	2,307	university	4,235
girl	990	old	2,182	government	4,196
group	976	good	2,132	mark	3,993

a) 1988–1997

b) 1998–2007
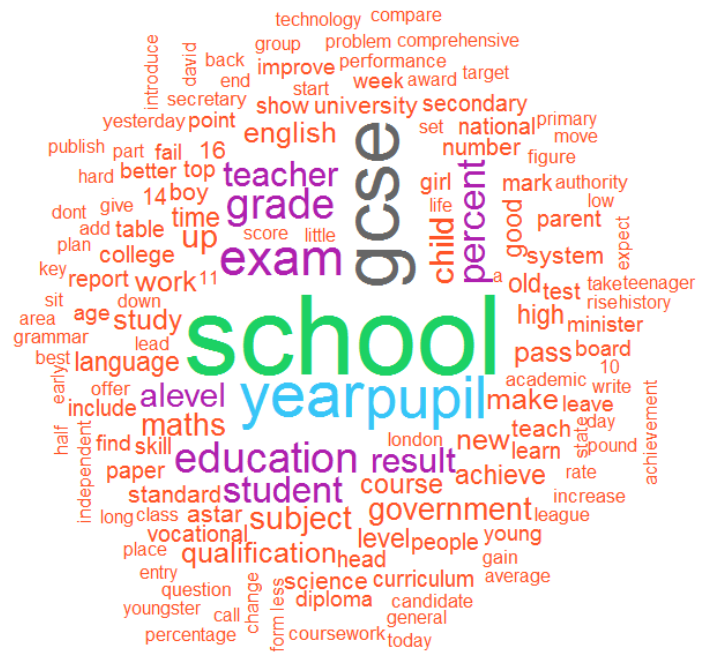
c) 2008–2017
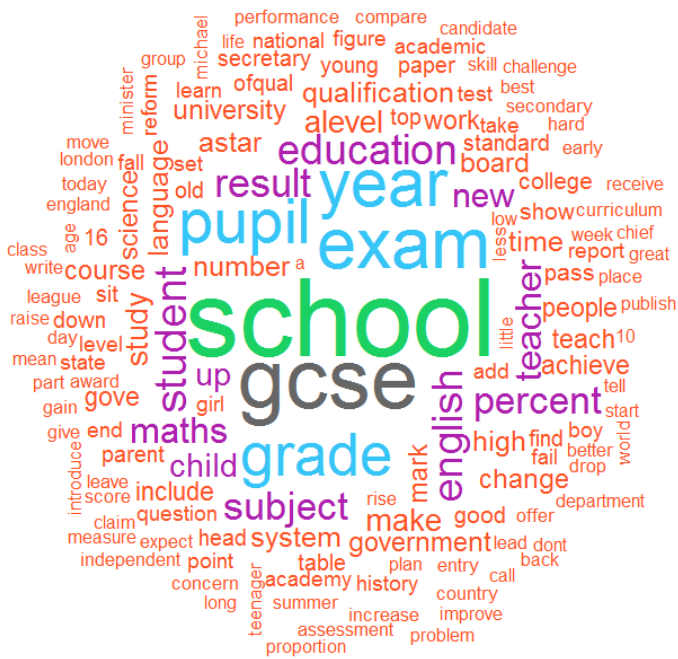
Figure 6: Word clouds for each decade of the corpus

Note: Each word cloud shows up to 150 words. Font sizes are scaled proportionally to the word count. Colours are applied relative to the normed frequency, such that orange words are ≤ 20% of the maximum, purple words are ≤ 40% of the maximum, etc.

There was little difference between decades when words were ranked by the number of articles in which they appeared (see Table 14), although again, "national" and "curriculum" appeared in the first decade but not thereafter. When analysed over months (see Appendix Table A2), similar words were used throughout the year, but "grade" and "result" showed increased prominence in the summer.

Table 14: The top 30 words based on the number of articles in which they occur, for each decade
Note: "GCSE" is excluded, as it occurred in every article.

1988–1997		1998–2007		2008–2017	
word	articles	word	articles	word	articles
school	828	school	1,987	school	3,402
year	795	year	1,949	year	3,307
exam	766	pupil	1,750	pupil	3,139
education	723	exam	1,646	exam	3,055
pupil	699	education	1,609	education	2,826
teacher	609	grade	1,469	grade	2,689
grade	599	up	1,416	english	2,459
up	555	result	1,296	student	2,453
subject	548	make	1,292	make	2,414
national	536	teacher	1,284	up	2,374
make	523	student	1,268	result	2,350
result	522	government	1,255	subject	2,345
work	496	subject	1,217	new	2,190
new	496	new	1,168	teacher	2,165
time	494	time	1,152	maths	2,098
percent	486	study	1,148	time	2,080
standard	481	work	1,146	high	2,011
government	465	high	1,131	include	1,921
english	449	alevel	1,121	number	1,917
old	447	qualification	1,109	government	1,910
course	445	old	1,096	study	1,909
high	433	pass	1,053	child	1,860
study	430	english	1,049	qualification	1,841
16	416	achieve	1,030	system	1,721
secretary	416	good	1,021	work	1,714
alevel	415	child	1,014	alevel	1,688
student	396	percent	1,008	good	1,686
science	393	maths	992	achieve	1,663
curriculum	390	number	983	show	1,655
child	383	level	963	percent	1,654

Correlations with counts of "GCSE" differed substantially between decades (see Table 15). In the first two decades "exam" showed the strongest correlation, although it was always weak. In the third decade, "English" showed the strongest correlation. "Olevel" was in the top 10 in the first two decades, showing the old O level qualification was still part of the discussion some years after GCSEs were introduced. In the first decade, various words reflected discussion around GCSE content, such as "content", "syllabus", and "topic". "Astar", "league", and "table" appeared in the second decade, reflecting new top grades and performance measures. "9" and "7" appeared in the third decade, reflecting the introduction of reformed GCSEs. It is also notable that "maths" and "English" appeared in the second decade and moved up ranks in the third, indicating increasing focus on core subjects.

Table 15: Pearson correlations with the word count of "GCSE" for each decade

1988–1997		1998–2007		2008–2017	
word	correlation	Word	correlation	word	correlation
exam	0.393	exam	0.263	english	0.451
olevel	0.372	subject	0.256	grade	0.443
easy	0.350	pupil	0.252	new	0.389
range	0.326	qualification	0.250	result	0.379
subject	0.316	grade	0.239	maths	0.378
work	0.308	olevel	0.231	year	0.369
pupil	0.304	astar	0.221	astar	0.368
course	0.296	course	0.217	achieve	0.359
content	0.294	year	0.214	pupil	0.324
time	0.294	gain	0.214	9	0.323
ability	0.293	maths	0.213	system	0.311
include	0.289	league	0.202	number	0.297
syllabus	0.289	pass	0.202	exam	0.295
topic	0.282	top	0.199	subject	0.293
information	0.281	worth	0.192	old	0.292
make	0.281	16	0.188	fall	0.292
experiment	0.281	table	0.186	top	0.292
find	0.279	english	0.183	entry	0.290
full	0.278	point	0.182	compare	0.288
grade	0.276	vocational	0.182	sit	0.283
section	0.274	entry	0.181	7	0.282
assessment	0.271	study	0.180	down	0.281
examiner	0.271	intermediate	0.179	16	0.280
paper	0.270	gnvqs	0.178	england	0.277
2	0.269	easy	0.177	percent	0.274
aim	0.267	general	0.175	score	0.270
fact	0.266	student	0.172	high	0.264
core	0.265	short	0.172	expect	0.264
up	0.265	little	0.172	proportion	0.262
prepare	0.265	joint	0.172	qualification	0.261

Over months (see Appendix Table A3), several patterns were evident. Strong correlations in January indicated a focus on school performance tables, whilst those in February and June appeared to reflect discussion of reforms. As expected, strong correlations in August were linked to the release of results, whilst those in September appeared to reflect the subsequent discussion of results. Patterns with less clear explanations were also seen, such as correlations in April appearing to be linked to discussion of science education.

Sentiments over time

The top negative and positive words remained similar over the three decades but showed some changes of position. For positive words (see Table 16), "good" was top in every decade. The second-ranked positive word was "better" in the first decade, "skill" in the second, and "top" in the third, perhaps indicating increased focus on high-attaining students. For negative words, "problem" and "concern" were the most common in the first decade, but "fail" and "problem" were top in the second decade, and "fall" and "fail" were top in the third decade. This could indicate that in the first decade, problems and concerns about the introduction of GCSEs were a major focus of coverage, but by the third decade, attention had switched to failure, falling results, or falling standards. It is also notable that "disadvantage" appeared in the third decade, possibly reflecting an increased focus on social issues in education, or on impacts of changes to the system. Word clouds indicating sentiment showed little difference between decades (see Figure 7).

Results for each month are shown in the Appendix (see Table A4, Table A5, and Figure A8). "Fail" was the top negative word in most months, and "good" was the top positive word in most months. However, in August and September, "top" became the top positive word, whilst in August, "fall" became the top negative word. This again shows the impact of the release of results on coverage. A more subtle pattern was that "error" appeared in the top 20 negative words in May, June, and July, perhaps highlighting a focus on errors in exam papers whilst exams were being taken. "Error" also appeared in January and December, which might reflect coverage of annual reports. It is also notable that "stress" appeared in the top 10 negative words in April and May, the period leading up to the summer exam series.

Table 16: The top 20 words classified as positive in each decade

1988–1997		1998–2007		2008–2017	
word	count	word	count	word	count
good	597	good	2,132	good	3,303
better	590	skill	1,721	top	2,770
top	581	top	1,689	award	1,930
skill	432	improve	1,347	lead	1,898
gain	431	better	1,334	better	1,882
award	397	gain	1,052	best	1,809
improve	386	lead	936	skill	1,809
lead	365	best	890	gain	1,693
great	358	award	792	improve	1,389
best	332	achievement	790	great	1,375
success	298	success	713	favour	1,200
achievement	293	improvement	638	easy	1,119
improvement	277	easy	633	support	1,108
important	261	great	630	free	989
modern	255	encourage	624	important	946
easy	239	support	601	clear	937
encourage	214	bright	567	encourage	928
favour	206	modern	550	progress	925
support	200	favour	540	modern	865
clear	195	progress	480	tough	813

Table 17: The top 20 words classified as negative in each decade

1988–1997		1998–2007		2008–2017	
word	count	word	count	word	count
problem	483	fail	1,280	fall	2,147
concern	343	problem	945	fail	2,136
fail	306	hard	875	concern	1,662
hard	301	concern	677	hard	1,571
fall	259	fall	670	problem	1,265
difficult	199	poor	594	poor	1,192
issue	199	issue	454	issue	865
limit	191	difficult	437	disadvantage	743
poor	173	miss	383	miss	741
decline	162	failure	376	scrap	741
difficulty	156	decline	328	decline	727
criticism	153	lose	303	difficult	677
worry	152	scrap	302	wrong	612
critic	134	wrong	287	risk	569
doubt	128	lack	283	fear	565
lack	128	worry	275	struggle	548
fear	126	struggle	259	worry	524
failure	109	worst	259	lose	494
wrong	107	fear	246	lack	483
lose	99	break	242	break	462

a) 1988–1997

b) 1998–2007

c) 2008–2017

Figure 7: Sentiment word clouds for each decade

Note: Font sizes are scaled by frequency of occurrence such that larger words occur more frequently. Scaling is only consistent within decades, so font size comparisons are not meaningful between decades. Blue indicates words classified as positive; orange indicates words classified as negative.

Sentiment summaries calculated for each decade (see Table 18) all had net positive sentiment, both in terms of the proportion of words and of articles. The second decade had the highest proportion of positive words and articles (56.2% assigned words, 65.7% articles), whilst the third had the lowest proportions (52.8% assigned words, 54.1% articles). The mean net sentiment score was similar across decades. When repeated separately for different source types (not shown), the pattern of an increase followed by a decrease was found for broadsheets, although tabloids and the specialist press both showed only gradual declines.

Each month had a positive net sentiment by assigned words (see Appendix Table A6). The most positive were in January (56.1% assigned words, 63.4% articles; coinciding with the release of league tables), August (55.8% assigned words, 62.6% articles; coinciding with GCSE results) and November (57.1% assigned words, 63.3% articles; potentially coinciding with the release of the *Sunday Times* schools guide). Conversely, the lowest positive balances occurred in May (51.1% assigned words, 49.5% articles) and June (50.7% assigned words, 51.4% articles), coinciding with exams being taken.

Table 18: Sentiment summaries for each decade

Decade	Sentiment	No. assigned words	% assigned words	% total words	No. articles	% articles	Mean sentiment (± SD)
1988–1997	Negative	12,898	46.3%	4.7%	351	39.4%	-7.2 (± 6.27)
	Positive	14,987	53.7%	5.5%	498	55.9%	9.3 (± 9.83)
	Neutral	–	–	–	42	4.7%	–
1998–2007	Negative	29,757	43.8%	4.7%	646	30.3%	-7.9 (± 9.97)
	Positive	38,121	56.2%	6.0%	1,402	65.7%	9.6 (± 9.70)
	Neutral	–	–	–	87	4.1%	–
2008–2017	Negative	57,591	47.2%	5.0%	1,555	41.0%	-7.8 (± 8.68)
	Positive	64,470	52.8%	5.6%	2,054	54.1%	9.3 (± 9.93)
	Neutral	–	–	–	188	5.0%	–

Article sentiment was plotted against month of publication (see Figure 8). The fitted smooth term showed that net sentiment started as negative, but then increased to a peak in the late 1990s and early 2000s. Sentiment then declined, suffering a particularly sharp drop between 2011 and 2013, before increasing again; this drop coincided with the decline in GCSE English grades noted above. However, the final years showed further sentiment decline. This pattern held if other sentiment summary methods were used (e.g., sentiment expressed as a percentage of total words; results not shown). The smooth term was significantly different from 0 ($p < 0.001$), and AIC values indicated that this was a better fit than a linear, quadratic or cubic model. Hence, change over time did not follow a simple parametric relationship. Inclusion of weights to reflect the number of articles published each month did not substantially affect the shape of the smooth term. The overall pattern was therefore that sentiment gradually became more positive, before becoming less positive again, with net negative periods in the late 1980s and in 2012–2013.
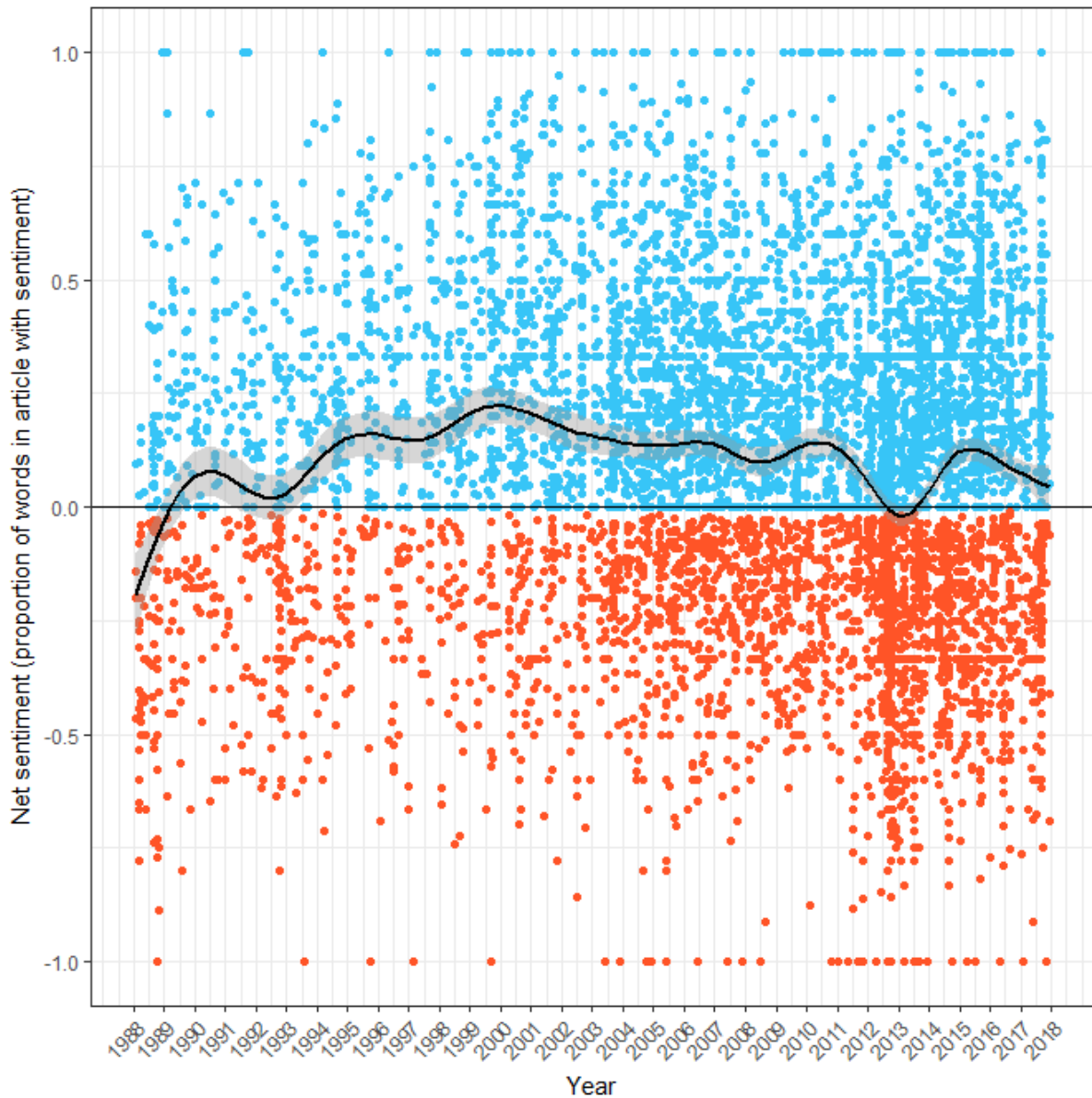
Figure 8: Article sentiment over time

Note: Each point represents the net sentiment score of a single article, expressed as the proportion of words in the article that had sentiment assigned. Articles are plotted on the month in which they were published. Orange points indicate articles with net negative sentiment, whilst blue indicates articles with neutral or positive sentiment. The black line is the smooth term from a GAM fitted to the data, expressing sentiment as a function of time; the grey shading indicates the 95% confidence interval of the smooth term.

Topic coverage over time

The proportion of articles and the proportion of total probability occurring in each topic were estimated separately for each decade (see Table 19)[14]. When articles were assigned to the topic with maximum probability, in the first decade "introduction of GCSEs" (Topic 45) was the largest topic, accounting for 23.7% of articles; this was followed by "curriculum & syllabus content" (Topic 22; 7.3%), then "vocational qualifications'"(Topic 19; 5.2%). In the second decade, the largest topic was "the Diploma" (Topic 7; 9.6%), followed by "inspections" (Topic 34; 4.5%), then "school comparisons" (Topic 50; 4.3%). In the third decade, "grade boundaries & marking" (Topic 5) was the largest (6.8%), followed by "results summaries" (Topic 10; 5.3%), then "Gove reforms" (Topic 26; 4.9%).

When probabilities were summed across articles, the first decade again showed "introduction of GCSEs" to be the largest topic (8.1%), followed by "curriculum & syllabus content" (4.6%), then "school comparisons" (3.1%). The second decade again showed "the Diploma" to be the largest topic (4.1%), followed by "targets & results" (Topic 18; 3.4%), and then "inspections" (2.8%). In the third decade the largest topic was again "grade boundaries & marking" (6.6%), followed by "results summaries" (3.4%), then "Gove reforms" (3.1%).

Dominant topics therefore corresponded to new features of each period, or to topics that gained particular prominence during that period. The first decade focused on the introduction of GCSEs and the National Curriculum, and to some extent on school comparisons arising from the introduction of league tables. The second decade focused on possible major reforms and on the growing importance of school performance data. The third decade focused on the Gove reforms, the increased attention paid to results, and the debate around grade boundaries linked to GCSE English in 2012.

The most common topics also varied by month (see Appendix Table A7). This suggested that topic coverage was largely based around recurring features of the educational year. "League tables" (Topic 29) was the largest topic in January, coinciding with the release of school league tables. "Results summaries" was the largest topic in August, coinciding with the release of results. "Grade boundaries & marking" was the largest topic in September, again probably linked to GCSE English grades in 2012. "School comparisons" was the largest topic in November, potentially coinciding with the release of the *Sunday Times* schools guide. Finally, in December, the largest topic was "exam boards & regulation" (Topic 17), coinciding with the annual Ofqual review of the summer exam series. On top of this annual cycle, some months showed the biggest topic to be linked to individual policy announcements or release of reports (e.g., June, the month in which Michael Gove initially announced reform plans, had "Gove reforms" as the biggest topic). Hence, the topics covered are strongly influenced by the annual cycle, but big announcements or occurrences can 'disrupt' the cycle.

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[14] Note that due to the way topics are defined, apparently impossible combinations of topics and decades can occur. For example, Topic 26, "Gove reforms", has a non-zero (albeit low) probability in the first two decades, before the topic could actually have been discussed. This is because many top words in the "Gove reforms" topic did occur in previous decades (e.g., education, Michael, secretary, Labour, plan, system, minister, exam, reform, O level, etc.; see Table 8 for the full list). Hence, although the topic was ostensibly about the Gove reforms (an interpretation supported by the peak in coverage around the time of the reforms), words associated with the topic were not restricted to that time period, allowing it to apparently be covered earlier than is actually feasible.

Table 19: The proportion of articles and of total probability falling into each topic, for each decade

Note: The table is sorted by descending order of % total probability in the third decade. See Footnote 14 for an explanation of how topics can appear in apparently inappropriate time periods. Topics with unclear interpretations are indicated with asterisks.

	Topic	1988–1997		1998–2007		2008–2017	
		% articles	% prob.	% articles	% prob.	% articles	% prob.
5.	Grade boundaries & marking	0.11%	1.21%	0.14%	1.09%	6.61%	**3.77%**
10.	Results summaries	4.53%	2.66%	3.36%	2.70%	5.29%	**3.43%**
26.	Gove reforms	0.22%	1.32%	0.23%	1.32%	4.92%	**3.14%**
28.	Qualification reforms (general)	0.04%	1.38%	0.30%	1.62%	3.66%	**3.03%**
40.	Reformed grades	0.39%	1.63%	0.58%	1.64%	4.16%	**2.80%**
18.	Targets & results	1.79%	2.64%	4.05%	3.38%	2.17%	**2.67%**
29.	League tables	0.99%	1.48%	2.43%	2.19%	3.34%	**2.56%**
11.	GCSE entries	0.34%	1.63%	0.75%	1.97%	1.62%	**2.54%**
17.	Exam boards & regulation	0.00%	1.28%	1.73%	1.74%	3.05%	**2.50%**
32.	Subject choice	1.12%	1.88%	0.56%	1.55%	3.39%	**2.47%**
14.	Personal perspectives	1.90%	1.96%	2.25%	2.26%	1.71%	**2.34%**
27.	Independent schools	0.56%	1.64%	2.85%	2.05%	3.57%	**2.34%**
48.	Disadvantage & socioeconomics	0.34%	1.46%	1.40%	1.94%	2.84%	**2.32%**
3.	Academies & school governance	0.00%	1.03%	2.08%	1.88%	3.32%	**2.27%**
6.	Employment & the workplace	1.34%	1.83%	1.22%	1.99%	2.26%	**2.25%**
30.	Exam papers, questions & marking	1.90%	2.14%	3.81%	2.06%	3.26%	**2.15%**
16.	Tragedies & problems	0.89%	1.37%	1.82%	1.65%	2.87%	**2.13%**
4.	School performance & improvement	3.52%	2.42%	2.40%	2.38%	1.18%	**2.05%**
47.	Languages	0.82%	1.30%	4.21%	2.26%	3.16%	**1.96%**
49.	English	2.74%	1.76%	1.80%	1.43%	2.62%	**1.95%**
12.	Core skills	1.01%	1.49%	3.77%	2.65%	2.30%	**1.94%**
39.	Research reports	0.67%	1.84%	1.10%	1.99%	0.83%	**1.91%**
2.	Universities	0.95%	1.61%	1.05%	1.71%	1.84%	**1.89%**
25.	Criticism of the education system	1.90%	2.36%	1.98%	2.03%	1.79%	**1.89%**
15.	Personal results stories	2.33%	1.63%	4.26%	2.59%	2.46%	**1.78%**

Table 19 (continued): The proportion of articles and of total probability falling into each topic, for each decade

	Topic	1988–1997		1998–2007		2008–2017	
		% articles	% prob.	% articles	% prob.	% articles	% prob.
8.	A levels & post-16 education	2.13%	2.44%	0.70%	2.04%	0.51%	**1.77%**
9.	Problems at school	1.01%	1.60%	0.80%	1.47%	1.69%	**1.77%**
21.	Religion & religious education	0.67%	1.31%	0.42%	1.21%	1.46%	**1.77%**
31.	Parental involvement & families	0.78%	1.74%	1.61%	1.96%	1.30%	**1.76%**
46.	Leaving school & exams at 16*	0.78%	2.23%	1.24%	2.41%	0.58%	**1.76%**
37.	Practical skills, media & social media*	0.50%	1.08%	1.08%	1.35%	2.33%	**1.75%**
42.	Teaching unions	1.79%	2.41%	0.75%	2.21%	0.25%	**1.71%**
38.	Countries of the UK	0.06%	1.28%	0.68%	1.40%	0.99%	**1.69%**
43.	History	3.08%	2.63%	1.33%	1.58%	1.61%	**1.68%**
19.	Vocational qualifications	5.20%	2.73%	4.28%	2.75%	1.59%	**1.67%**
23.	Teaching	0.93%	2.19%	0.73%	1.92%	0.55%	**1.66%**
50.	School comparisons	5.09%	3.14%	4.32%	2.75%	1.42%	**1.64%**
1.	Ethnicity	0.11%	1.08%	1.87%	1.53%	1.42%	**1.62%**
20.	Poor results*	0.22%	1.52%	0.42%	1.71%	0.68%	**1.62%**
13.	Revision & miscellaneous time use*	1.10%	1.70%	1.85%	1.79%	1.43%	**1.60%**
24.	Coursework & assessment methods	3.64%	2.78%	2.69%	2.03%	0.94%	**1.60%**
41.	Science	2.13%	2.09%	2.27%	1.68%	1.16%	**1.59%**
44.	Profiles of schools, courses & initiatives*	2.01%	1.91%	1.61%	2.01%	0.88%	**1.59%**
36.	Money & finances	1.23%	1.92%	1.52%	1.93%	1.04%	**1.54%**
35.	Learning methods & technology	1.23%	1.70%	2.01%	1.88%	0.94%	**1.47%**
34.	Inspections	2.01%	2.22%	4.46%	2.82%	0.68%	**1.46%**
22.	Curriculum & syllabus content	7.27%	4.10%	0.94%	2.02%	0.28%	**1.38%**
33.	Gender	2.68%	1.88%	2.55%	1.99%	1.07%	**1.38%**
7.	The Diploma	0.22%	1.24%	9.57%	4.13%	0.91%	**1.33%**
45.	Introduction of GCSEs	23.71%	8.13%	0.14%	1.36%	0.08%	**1.11%**

The final topic analysis was to examine finer-scale, longer-term trends in coverage (see Figure 9). There were rises in probability attributed to "ethnicity" (Topic 1), "universities" (Topic 2), "employment & the workplace" (Topic 6), "results summaries" (Topic 10), "GCSE entries" (Topic 11), "personal perspectives" (Topic 14), "league tables" (Topic 29), "research reports" (Topic 39), "languages" (Topic 47), and "disadvantage & socioeconomics" (Topic 48). These results suggest that there has been increased focus on social justice, results and performance, employment, and university.

Other topics showed decreasing probability, implying a reduction in coverage: "A levels & post-16 education" (Topic 8), "vocational qualifications" (Topic 19), "teaching" (Topic 23), "coursework & assessment methods" (Topic 24), "criticism of the education system" (Topic 25), "science" (Topic 41), "teaching unions" (Topic 42), and "history" (Topic 43) all declined. It should be considered, however, that because the coverage measure used was proportional, if the range of topics diversified over time, topics from the earliest years might appear to lose prominence even if, in absolute terms, their coverage remained constant.

Several topics showed high coverage in one particular period. These were "academies & school governance" (Topic 3), "grade boundaries & marking" (Topic 5), "the Diploma" (Topic 7), "core skills" (Topic 12), "tragedies & problems" (Topic 16), "curriculum & syllabus content" (Topic 22), "Gove reforms" (Topic 26), "independent schools" (Topic 27), "qualification reform (general)" (Topic 28), "gender" (Topic 33), "inspections" (Topic 34), and "introduction of GCSEs" (Topic 45). Some of these could be linked to specific events (e.g., GCSE English pass rate decline). Others could be linked to the introduction of new features at a particular time point (e.g., GCSEs being launched). Others, meanwhile, may simply have been linked to topics that gained prominence in a particular period, before becoming 'less interesting' again. A further notable pattern was that of "subject choice" (Topic 32), which showed rises associated with the introduction of GCSEs and the Gove reforms, perhaps suggesting that it was of most interest at times of change.

The monthly cycle of topic coverage was also analysed (see Appendix Figure A9). "Academies & school governance" (Topic 3), "school performance & improvement" (Topic 4), "targets & results" (Topic 18), "league tables" (Topic 29), and "school comparisons" (Topic 50) showed peaks in January, associated with release of league tables. Release of results in August was associated with peaks in "grade boundaries & marking" (Topic 5), "results summaries" (Topic 10), "personal results stories" (Topic 15), "poor results" (Topic 20), "gender" (Topic 33), and "reformed grades" (Topic 40). April to July showed peaks in "problems at school" (Topic 9), "revision & miscellaneous time use" (Topic 13), "tragedies & problems" (Topic 16), "exam papers, questions & marking" (Topic 30), "learning methods & technology" (Topic 35), and "practical skills, media & social media" (Topic 37), showing increased focus on students' personal lives around exams. Intriguingly, "criticism of the education system" (Topic 25) showed slightly *reduced* coverage in the period leading up to summer exams. Other patterns may have been linked to specific stories, such as a peak in May for "English" (Topic 49) associated with an error in an English literature exam, or peaks in "the Diploma" (Topic 7) in February and October, associated with the release of the Tomlinson report and the Government white paper in response. The results therefore reinforce the finding that topic coverage is primarily structured around the exam cycle.
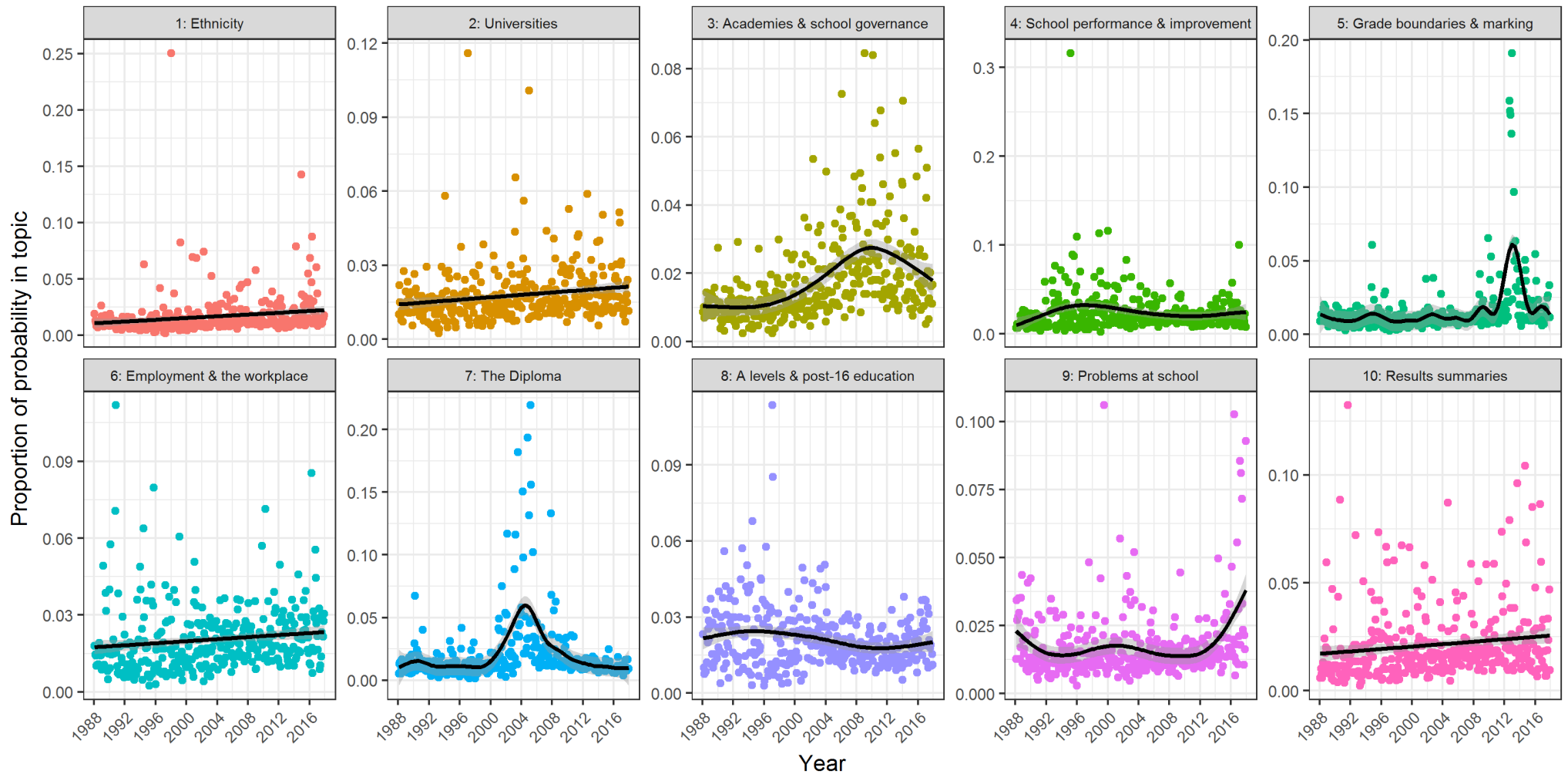
Figure 9: The proportion of probability attributed to each topic for each month in the corpus

Note: Each point represents the proportion of probability in a single month attributed to that topic. Black line is the smooth relationship between probability and time from a fitted GAM; grey shading indicates the 95% confidence interval. Topics with unclear interpretations are indicated with asterisks.
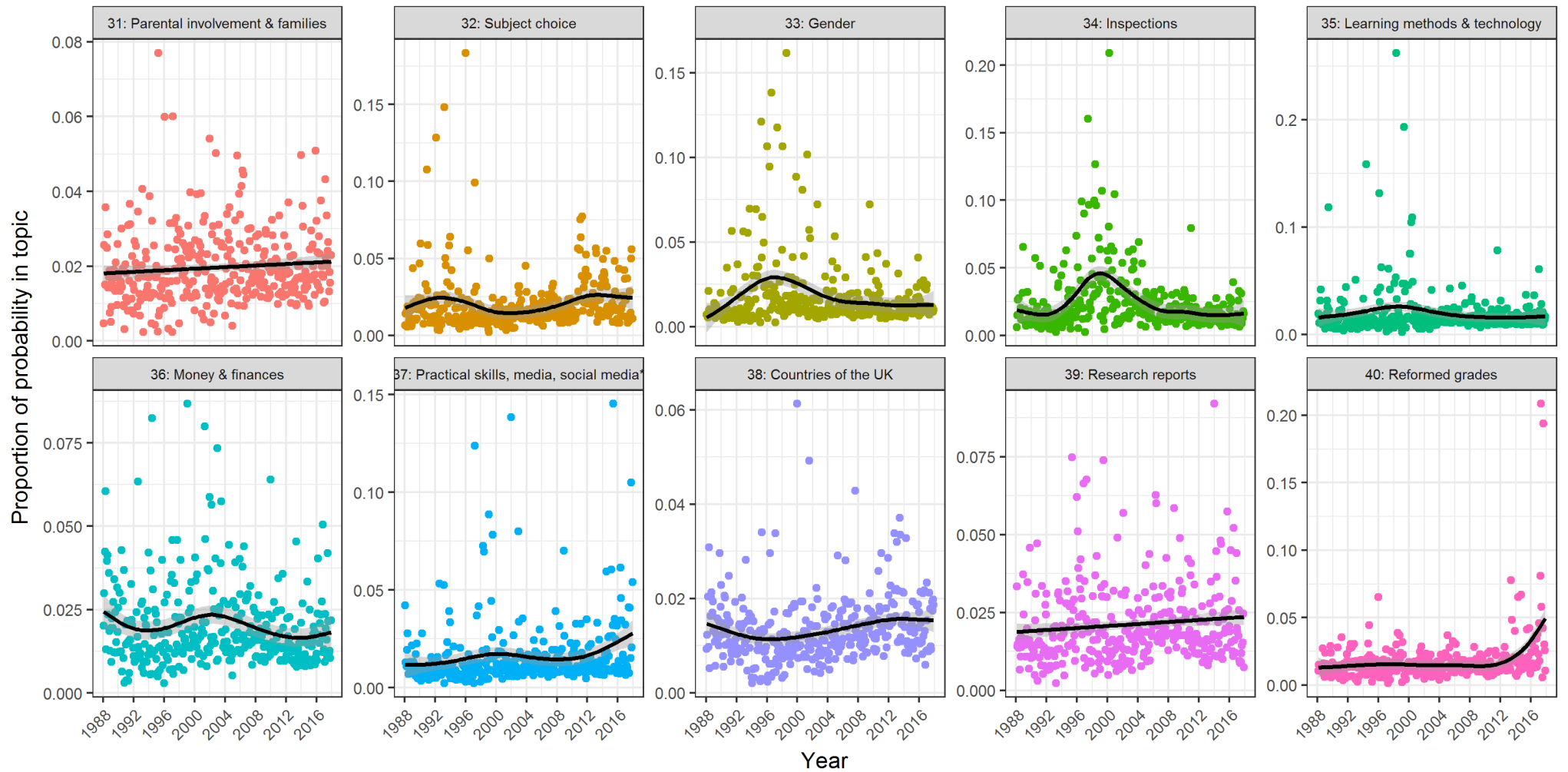
Figure 9 (continued): The proportion of probability attributed to each topic for each month in the corpus
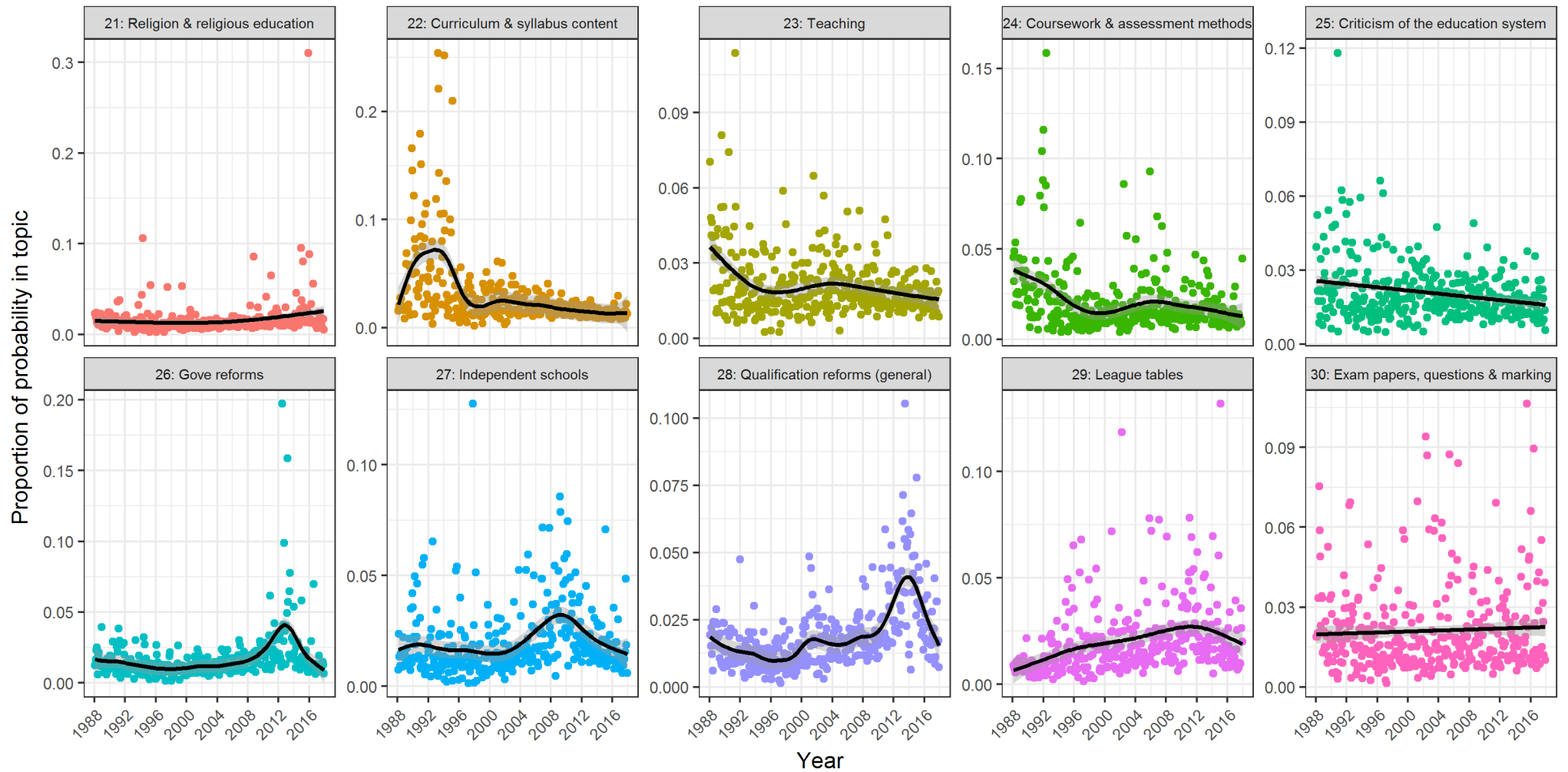
Figure 9 (continued): The proportion of probability attributed to each topic for each month in the corpus

Figure 9 (continued): The proportion of probability attributed to each topic for each month in the corpus

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Usage of key words and buzzwords over time

The final analysis considered the use of 'buzzwords' and phrases related to specific topics of interest. The proportion of articles in a given month that contained the phrase was plotted against time to examine changing usage. The first theme explored was the narrative of falling standards (see Figure 10). Usage of "standard" and "slip" (e.g., "standards have slipped") was examined. Against expectations, usage decreased, although "standard" remained highly used. To further explore this, the phrases "dumb down" and "grade inflation" were examined. "Dumb down" showed a rise and fall in the 2000s, peaking around 2008–10, whilst "grade inflation", showed a gradual increase, peaking in the mid-2010s. Hence, although formal discussion of standards may be less prominent than previously, it remains a frequent part of the discussion. Meanwhile, concerns about "dumbing down" and "grade inflation" may have increased since GCSEs were introduced, but may be declining again. When occurrence was plotted over months (see Appendix Figure A10), "standard", "slip", and "dumb down" showed slight peaks around July, whilst "grade inflation" showed a peak in August and September, perhaps suggesting that criticism shifts throughout the exam series, from standards to outcomes.
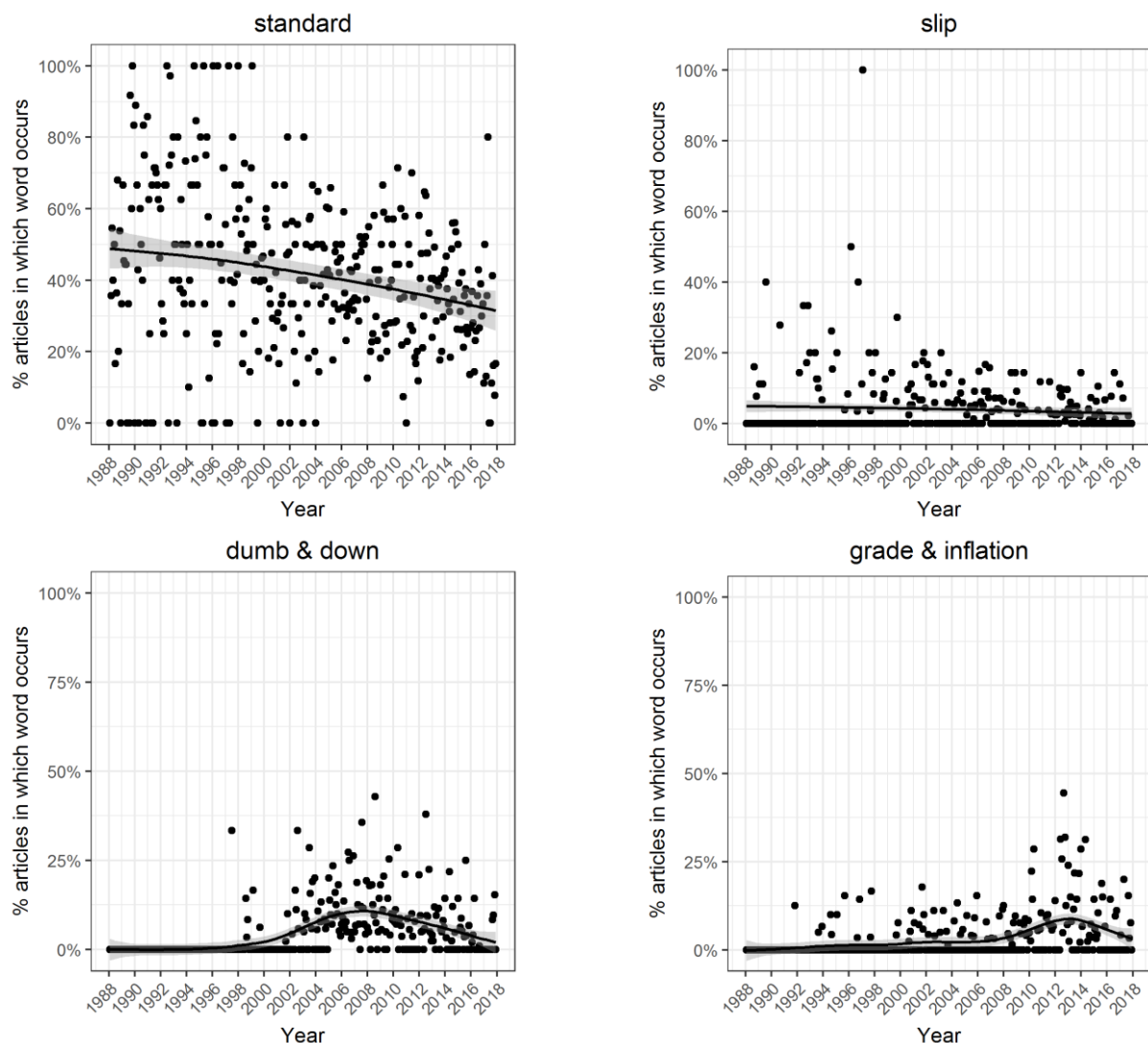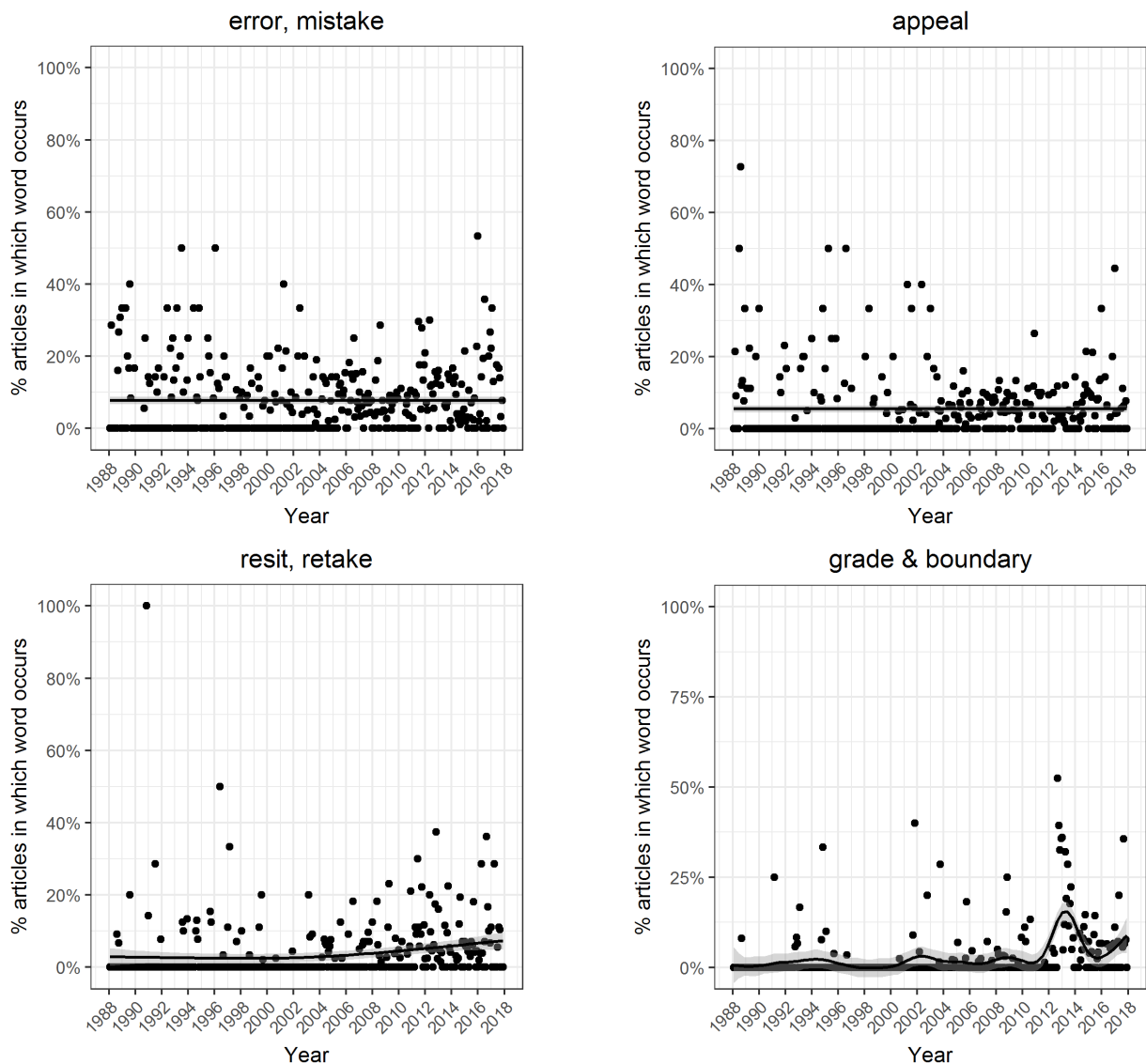

Figure 10: Occurrence of words and phrases relating to standards over time

Note: Each point represents the proportion of articles in which the phrase occurred in a single month. The solid line is the smooth term fitted to data; grey shading indicates the 95% confidence interval.

A further theme explored related to exam administration. Usage of "board" was examined, along with exam board and regulator names (see Figure 11). "Board" started at high levels around the time GCSEs were introduced, before declining then increasing again. Usage of specific exam board names increased gradually before levelling off, whilst usage of regulator names increased strongly, peaking around 2012, before declining again. This suggests that, initially, there was high interest in exam boards, but specific exam boards were rarely mentioned. Since the late 1990s, however, coverage of specific exam boards and regulation increased. Over months (see Appendix Figure A11), "board" and board names showed peaks in May and December; "board" also showed a peak in August. Meanwhile, regulator names showed a large peak in December. These patterns suggest that exam boards primarily reach the press during the summer series, release of results, and the annual review of the summer series.
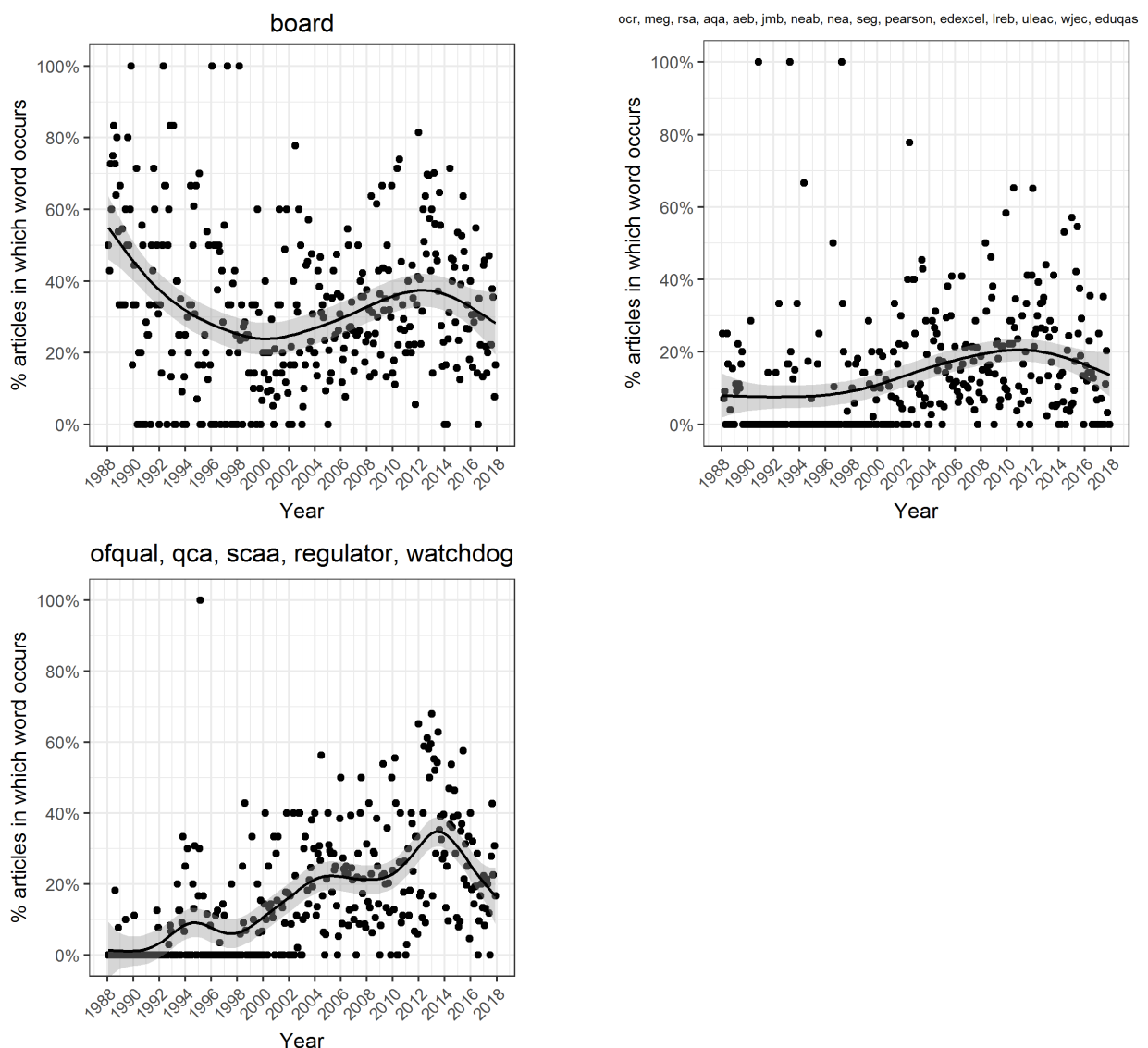
Figure 11: Occurrence of words and phrases relating to exam administration over time

Note: Each point represents the proportion of articles in which the phrase occurred in a single month. The solid line is the smooth term fitted to data; grey shading indicates the 95% confidence interval.

Words related to the types of events that might bring exam boards into the news were also examined (see Figure 12). There was no significant change in "error" or "mistake", although there was a hint of a decrease then increase in the raw data. A similar pattern was seen for "appeal". More years of data might confirm whether a quadratic relationship exists. "Resit" and "retake" showed a slight increase, suggesting that there may be increased attention paid to students resitting exams. "Grade boundary" was at low levels for most of the time, but showed a spike around 2012, coinciding with the GCSE English grading debate. Over months (see Appendix Figure A12), "error" and "mistake" showed increased coverage in May and June, and then again in September and December, again showing how coverage is linked to the annual exam cycle. "Appeal" primarily showed a peak in December, whilst, "resit", "retake", and "grade boundary" peaked in September.

Figure 12: Occurrence of words and phrases relating to coverage of exam board activity over time
Note: Each point represents the proportion of articles in which the phrase occurred in a single month. The solid line is the smooth term fitted to data; grey shading indicates the 95% confidence interval.

Another area explored was whether concerns about the health and wellbeing of students and/or teachers had become a greater feature of coverage. Consequently, "stress", "health", and "mental health" were explored (see Figure 13). "Stress" fluctuated over time, but showed a slight increase from 2010 onwards. It should be noted, of course, that the object of the stress cannot be determined from this analysis, and that the verb "to stress" (e.g., "the Minister stressed that…") could also be included. "Health" showed no significant change over time, but "mental health" showed an increase from the mid-2010s. Hence, despite relatively little coverage, there were suggestions of increased coverage of stress and mental health in the most recent years. Over months (see Appendix Figure A13), "stress" showed a peak from April to July, coinciding with summer exams. Neither "health" nor "mental health" showed prominent patterns of change within years.
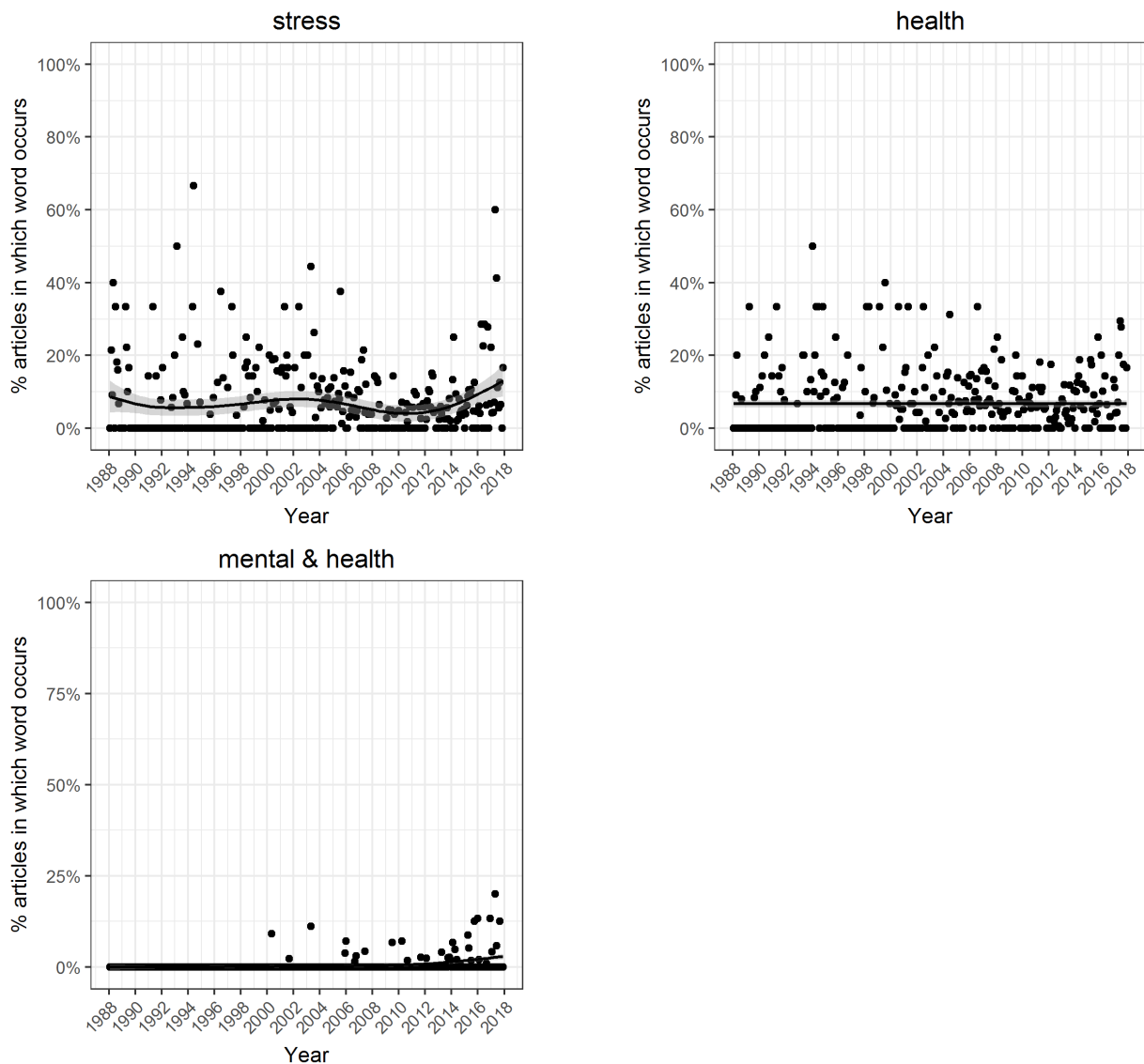
Figure 13: Occurrence of words and phrases relating to coverage of the health and wellbeing of students and/or teachers over time

Note: Each point represents the proportion of articles in which the phrase occurred in a single month. The solid line is the smooth term fitted to data; grey shading indicates the 95% confidence interval.

The impact of the internet and social media on coverage was explored (see Figure 14). As may be expected, "online" only appeared in the late 1990s as internet access became common. "Social medium" ("media" having been replaced in lemmatisation) and the specific platforms of "Facebook" and "Twitter" all showed growth from around 2009 onwards, with particularly strong growth in "Facebook" and "Twitter". "Petition" is not specific to the internet, but availability of online petitions could have increased their usage; this interpretation was partly supported by the data, with a hint of an increase in more recent years. These plots therefore show how the internet, and particularly social media, now play a role in coverage of GCSEs. When plotted over months (see Appendix Figure A14), "online" and "petition" showed pronounced peaks in May, which may reflect a specific story one year, or may be a time when petitions are used to attract attention. "Social medium", "Twitter" and "Facebook" all showed a peak from May through to July/August, probably representing stories about student responses to exams, whereby students "took to Twitter" to express their thoughts.
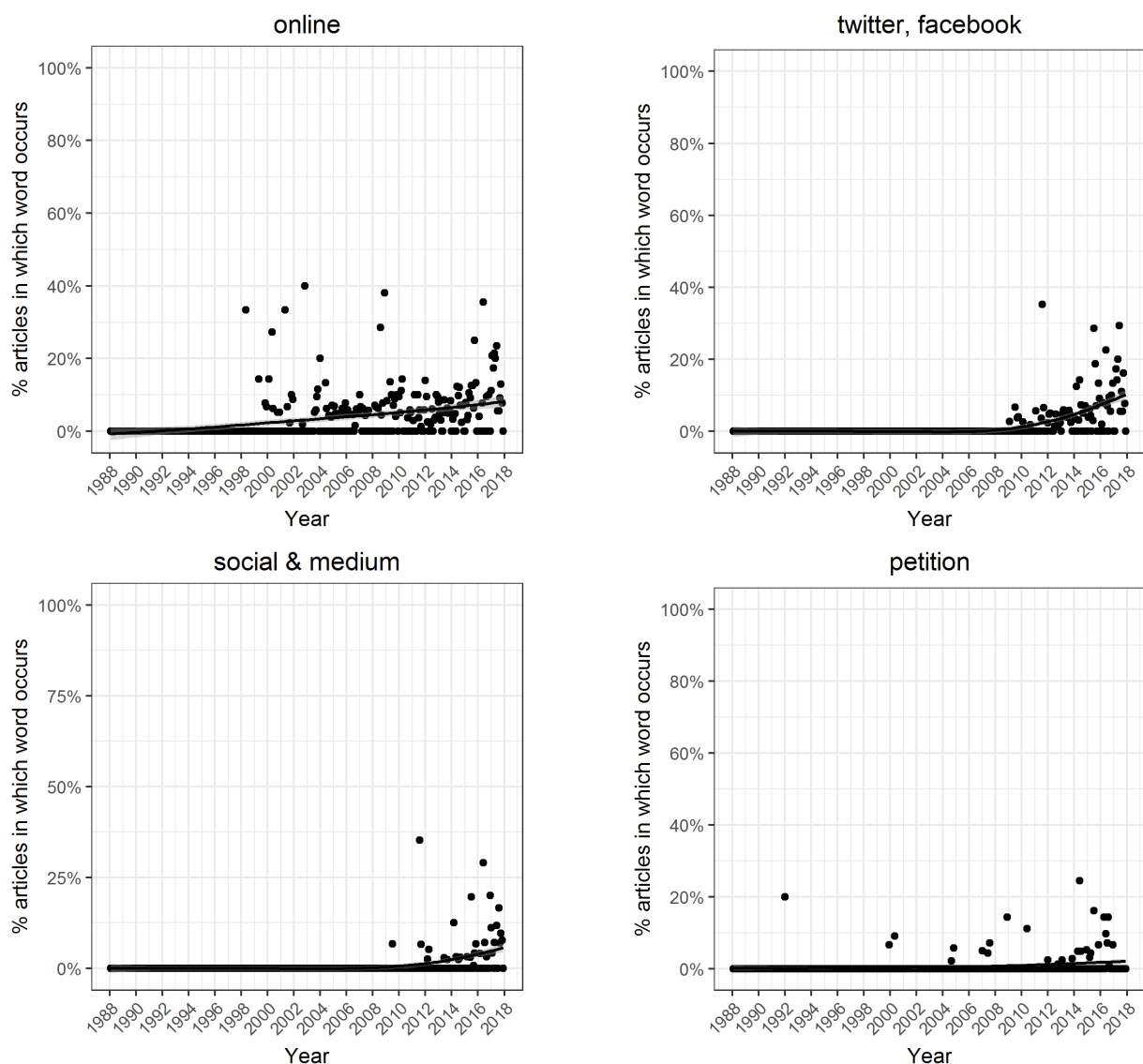
Figure 14: Occurrence of words and phrases relating to the internet and social media over time

Note: Each point represents the proportion of articles in which the phrase occurred in a single month. The solid line is the smooth term fitted to data; grey shading indicates the 95% confidence interval.

Word counts presented earlier in the report suggested that coverage of subjects studied may have changed over time, so "maths", "English", and the names of individual science subjects were explored, representing what may be considered 'core' subjects (see Figure 15). As anticipated, English and maths showed increasing coverage, although whilst that for maths was quite gradual, that for English was highly fluctuating. In particular, a peak in English occurred around 2012, coinciding with the grade boundary debate. Conversely, occurrence of science subjects decreased gradually. This pattern could suggest that coverage of English and maths is increasing at the expense of other subjects, including 'core' science subjects. None of the subject words showed pronounced seasonal patterns when occurrence was plotted over months (see Appendix Figure A15).
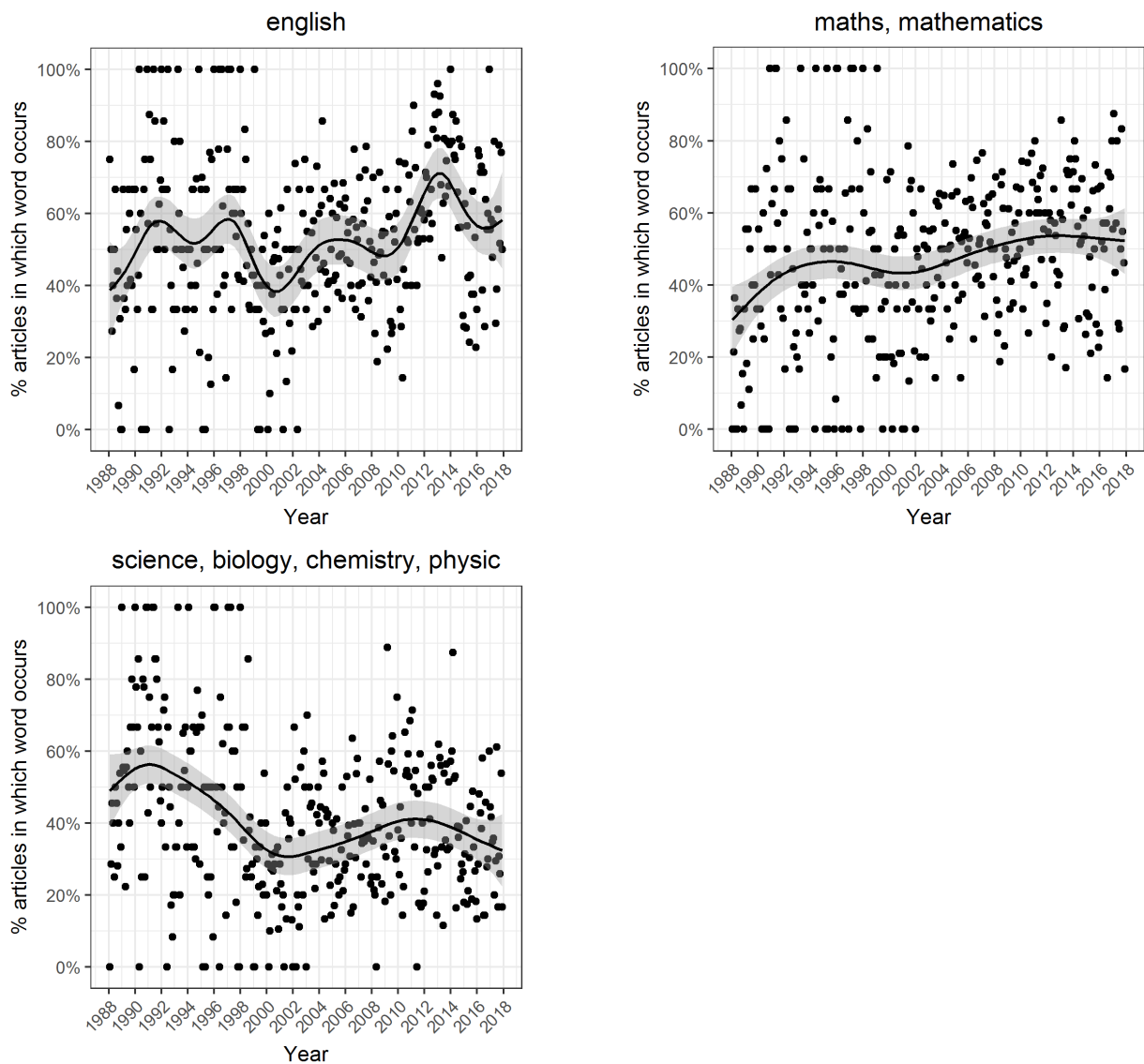
Figure 15: Occurrence of words and phrases relating to core subjects over time

Note: Each point represents the proportion of articles in which the phrase occurred in a single month. The solid line is the smooth term fitted to data; grey shading indicates the 95% confidence interval.

Word counts also suggested that the people who were the focus of coverage might have changed, so usage of "pupil", "student", and "child" was compared to "teacher" and "staff" (see Figure 16). There was no significant change in the usage of words relating to students, but the minimum values all occurred in the earlier years of the corpus, possibly hinting at an increase. Conversely, there was a significant decrease in occurrence of "teacher" or "staff", supporting earlier suggestions of a shift in usage. No seasonal patterns were evident in usage of these words (see Appendix Figure A16).
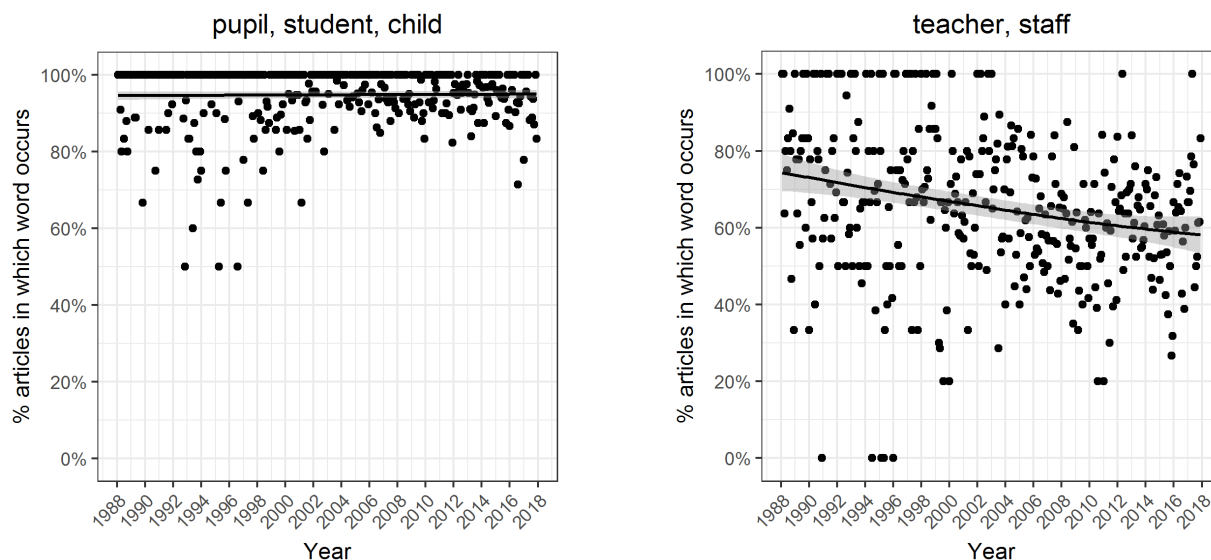
Figure 16: Occurrence of words and phrases relating to students and teachers over time
Note: Each point represents the proportion of articles in which the phrase occurred in a single month. The solid line is the smooth term fitted to data; grey shading indicates the 95% confidence interval.

The final plots considered phrases relating to a range of education topics that were considered to be buzzwords, phrases heavily used at particular times (see Figure 17). Against expectations, none showed strong patterns of change or usage. "Broad (and) balanced" had its highest usage in the early years of the corpus, but did show some higher usage in the latter years too. "Fit (for) purpose" showed a rise and fall between 2004 and 2017, but remained at low levels. "Race (to the) bottom", meanwhile, showed an even sharper, smaller peak between 2012 and 2017. "Teach (to the) test" and "(two) tier system" both showed a small number of higher occurrences in the early years, but a large number of lower-level occurrences in later years, suggesting that it they are perhaps being used more frequently but not at high levels. These results raise the question of whether the method of detecting key words is effective at identifying multiple-word phrases: these phrases were specifically suggested as buzzword', but all were found to occur only at low levels. Alternatively, it may imply that phrases can gain prominence without being used too extensively: it is unclear what level of usage would make a phrase appear to be a buzzword to people. When plotted over months (see Appendix Figure A17), peaks in June and September were seen in "fit (for) purpose", "race (to the) bottom", and "(two) tier system", suggesting that these phrases are primarily used in the discussion following summer exams and then again following results.
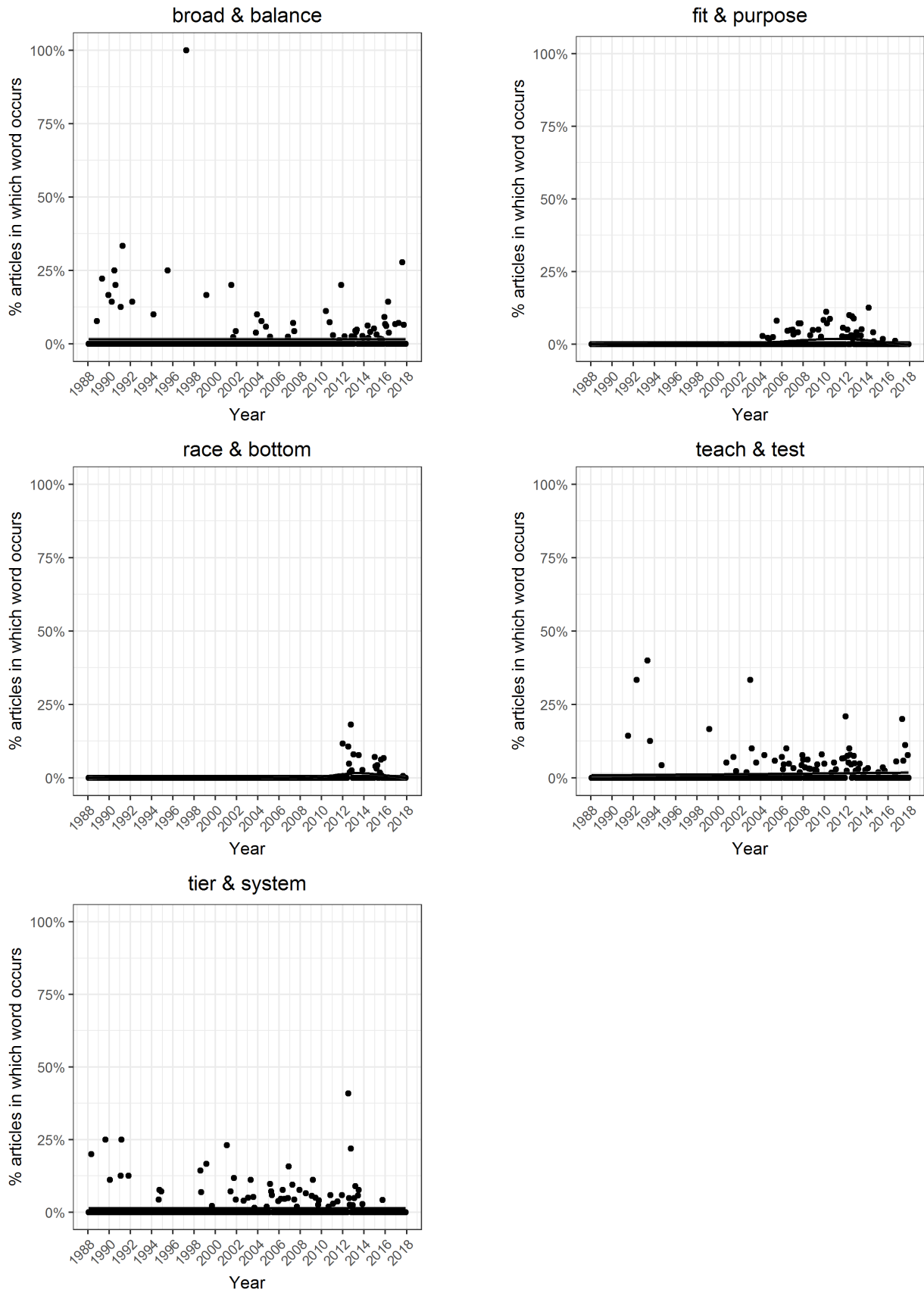
Figure 17: Occurrence of words and phrases relating to educational buzzwords over time

Note: Each point represents the proportion of articles in which the phrase occurred in a single month. The solid line is the smooth term fitted to data; grey shading indicates the 95% confidence interval.

Discussion

Key results

Several broad conclusions can be drawn from the analysis. The first, and perhaps the simplest, is that text mining can be applied to a corpus of this type and size. Previously published analyses of exam news coverage have dealt with 200–850 articles (Shannon, 2005; Warmington & Murphy, 2004); the present analysis analysed nearly 7,000 articles. Indeed, previous work within the Cambridge Assessment Research Division has used text mining on over 6 million tweets (Sutch & Klir, 2017). This suggests that the methods are robust and flexible, and can be used to explore the public discourse around education.

News coverage was heavily structured by the annual exam cycle. Coverage of results in August was the dominant feature, as has been found in analyses of A level reporting (e.g. Murphy, 2013; Warmington & Murphy, 2004, 2007). School league tables, summer exams, 'good school' guides and regulator reports were also important annual features. In addition, 'big events' influenced coverage, in particular reforms such as the introduction of GCSEs, the Tomlinson review into the 14–19 Diploma, and the Gove reforms. Longer-term trends indicated an increasing focus on results and 'core' subjects. This suggests a model of coverage in which political interventions and gradual societal shifts determine longer-term trends, with the annual education cycle imposing a regular, shorter-frequency pattern on top of these trends.

Unexpectedly, overall sentiment was positive, but this must be interpreted cautiously: the simple dictionary-based method for assigning sentiment may not accurately reflect the actual sentiment expressed. However, topics related to problems and the exam system displayed net negative sentiments, and negative sentiment occurred following the introduction of GCSEs and in 2012–13, showing that positive sentiments were not inevitable. Hence, although criticism is a common feature of education coverage (e.g. Mansell, 2013; Newton, 2005; Warmington & Murphy, 2004, 2007), overall sentiment may not be as negative as previously described. Previous analyses of coverage of UK exams have highlighted criticisms around grade inflation (Shannon, 2005; Warmington & Murphy, 2004, 2007), but here, the event that caused the sharpest drop in sentiment was when grades fell. This suggests that the relationship between pass rates and sentiment may not be simple; these findings are discussed further below.

A final broad conclusion relates to the types of source examined. There was less difference between tabloids and broadsheets than might have been expected: the most frequently used words were similar, and there was overlap in topic coverage. Some differences were observed: broadsheets were more positive than tabloids, tabloids gave greater prominence to 'personal' topics, and tabloids appeared to focus more on top grades. Generally though, the largest differences were between the general and specialist press, with the specialist press showing different vocabulary and topic coverage, and displaying the most positive sentiment scores. Hence, when considering education press coverage, it is important to consider how messages differ between those working in education and the wider public.

The rest of this discussion will address several emerging themes from the analysis. The quantity of results means that not every finding can be discussed in detail, but several results pertinent to the perception of GCSEs and exam boards will be explored.

What are GCSEs?

The annual exam cycle dominated coverage, with "exam" always in the top 5 most frequent words. "Qualification" featured in the top 30 words overall and for broadsheets, but not in tabloids. Further, "coursework" only featured in the word cloud of the top 150 words, whilst the "coursework and assessment methods" topic was ranked 32nd out of 50 (based on overall probability). It therefore appears that, in the press, GCSEs are indivisible from final exams. The concept of GCSEs as qualifications gained through varied assessments does not seem to have translated into the wider discussion[15], and it seems probable that the shift to linear assessment will further tie understanding of GCSEs to final exams.

It may be of some concern that GCSEs are so closely linked to exams, because all topics relating to exams and exam administration showed net negative sentiments. Indeed, sentiment scores for the "grade boundaries and marking" and "exam papers, questions and marking" topics were more negative than that for "tragedies and problems". This might reflect the fact that the exam system is mainly reported on when problems occur: Baker (1994) argues that "…it is right to concentrate on problems which need to be addressed rather than successes which deserve praise, but do not necessarily require action" (p. 293). However, if GCSEs are primarily associated with exams, this ties the qualification to the negative sentiments associated with the exam system. A similar process might explain previously published findings of critical A level coverage (Warmington & Murphy, 2004, 2007). Public perception of GCSEs is already monitored[16]; results here suggest that it may be useful to investigate how coverage of the exam system influences these perceptions.

It is perhaps curious, given the negative sentiment associated with exams, that the most positive sentiments related to results coverage. Articles in the "personal results stories" topic profiled high-attaining students, whilst articles in the "school comparisons" and "school performance and improvement" topics profiled schools gaining good results. Therefore, there was a complex contradiction central to all coverage: GCSEs are indivisible from exams; the exam system is viewed negatively; but individuals and schools gaining good GCSEs are viewed positively. This may be pragmatic: newspaper readers are often supportive of their local school and do not want children's achievements to be belittled, but the system can still be criticised (Baker, 1994; Shannon, 2005). Indeed, as Shannon (2005) notes, "…whilst it is foolish to print criticism of one's readers, it would risk commercial suicide to print criticism of their children" (p. 54). Alternatively, it may imply that despite criticism of the system, there remains sufficient trust in it that attaining good GCSEs is still viewed positively.

Focus of coverage: people

A notable finding concerned *who* was being written about. The word "teacher" fell from the 6th ranked word in the first decade to 14th in the third decade. Conversely, "pupil" increased from 5th to 3rd, and "student" increased from 27th to 8th. The model examining use of "pupil",

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[15] Articles about coursework in the corpus typically focused on debates about its value. See, for example, Judd, J. (1994, August 25). Results leave opinion split on GCSE: Marginal increase in success rate fuels coursework debate. *The Independent*. https://www.independent.co.uk/news/uk/results-leave-opinion-split-on-gcse-marginal-increase-in-success-rate-fuels-coursework-debate-judith-1385559.html, accessed April 9, 2018. See also Clark, L. (2013, February 8). What's so bad about coursework? *The Independent*. https://www.independent.co.uk/voices/comment/what-s-so-bad-about-coursework-8486839.html, accessed April 9, 2018.

[16] See Ofqual. (2018). *Perceptions of A levels, GCSEs and other qualifications*. https://www.gov.uk/government/statistics/perceptions-of-a-levels-gcses-and-other-qualifications-wave-16, accessed August 8, 2018.

"student", and "child" showed that these words were used at high levels across the 30 years. Meanwhile, the model examining use of "teacher" and "staff" showed a significant decrease in usage, and coverage of 'teaching' and 'teaching unions' topics declined. Hence, GCSEs appeared to be increasingly written about in the context of students rather than teachers.

This does not confirm that coverage of teachers has declined: there may be numerous articles about teachers that were simply not included. Indeed, growth in education coverage might have allowed increasing specialisation, with issues relating to teachers given their own focused coverage[17]. However, observed differences may imply a shift toward 'student-focused', rather than 'school-focused' or 'teacher-focused', coverage of GCSEs. This could, in turn, indicate increasing separation of the system (which can be criticised) from individuals (who are often celebrated): this theme is explored further in following sections.

Sentiment scores also differed between students and teachers. Topics related to teaching had relatively low sentiment scores, whilst students were a major focus of some of the most positive topics (e.g., "personal results stories"). Previous analyses suggest that coverage of teachers can be negative or demotivating (Hargreaves et al., 2007; Shine, 2017). However, the low sentiment score could reflect the types of stories that make the news, such as cheating or scandals (Hargreaves et al., 2007), or even reporting of problems faced by teachers (supportive articles could still contain negative language). Indeed, Hargreaves et al. (2007) state that coverage of teachers became more supportive through the 1990s and 2000s. Hence, whilst this finding does not necessarily indicate that coverage of teachers was critical, it does indicate that teachers and students were written about quite differently.

Focus of coverage: key topics
It is also important to consider *what* was written about. GCSEs were written about primarily in the context of exams, but dominant topics and words related to results. "Percent", "grade" and "result" were among the most frequently used words overall, and "results summaries" and "targets and results" were the largest topics. There were 1,761 corpus articles from August (compared to a maximum of 680 articles in any other month), the month in which results are released. Although the reason for the focus on results could not be examined here, it has been suggested that it is partly due to results being released in 'silly season' when the press has little else to write about, and partly due to the combination of predictability and personal relevance (Baker, 1994; Murphy, 2013; Shannon, 2005).

Coverage of results increased over the years studied. Shannon (2005) found that coverage dedicated to exam results increased from 1989 onwards, and here, this trend appeared to continue. It has been argued that education is increasingly focused on results and league tables[18], so increased coverage could reflect this process. Alternatively, coverage could itself influence the education system: results are highly visible because of the time of year and

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[17] See, for example, the Guardian Teacher Network, https://www.theguardian.com/teacher-network, accessed April 9, 2018.

[18] See, for example, Collins, N. (2012) School league tables 'causing drop in standards'. *telegraph.co.uk*. https://www.telegraph.co.uk/education/secondaryeducation/9038770/School-league-tables-causing-drop-in-standards.html, accessed April 9, 2018. See also Cooper, L. (2017) 'Put work skills back on curriculum': Government guru argues focus on GCSE and A-level results means we could be failing next generation". *Mail on Sunday*. http://www.dailymail.co.uk/money/news/article-4805512/Why-policy-makers-focused-levels.html, accessed April 9, 2018.

personal interest (Baker, 1994; Murphy, 2013); as the most visible part of the system, this could attract political attention. Hence, extensive coverage of results could be an example of the media's agenda-setting role (McCombs, 2014; McCombs & Shaw, 1972).

Increased focus on results may be considered by some to be a negative development (see Footnote 18), but topics related to results were among the most positive. This may, again, reflect the idea that negative coverage could upset readers. Of course, critical pieces are published at a similar time, explaining the peak in 'criticism of the education system' in August; Warmington and Murphy (2007) have previously noted that "…stories celebrating students' A-level triumphs run side by side with columns condemning 'exams you can't fail'" (p. 81). However, criticism might be clustered into opinion pieces (Shannon, 2005), leaving news articles more positive. Hence, although a greater focus on results may be perceived negatively, it may, ironically, be responsible for the positive sentiment found here.

A further notable aspect was a focus on the top end of achievement, particularly in tabloids. "Astar" (i.e., the A* grade) was in the top words for tabloids and in 2008–2017, whilst "9" and "7" were in the top 10 correlations with "GCSE" in tabloids. It has been argued that the media focuses on the percentage of candidates gaining A*-C (Mansell, 2013), but these results suggested that coverage was dominated by the very highest grades. This might contribute to high sentiment scores: "top", "bright", and "best" appeared in the top 20 positive words. However, if newspapers disproportionately cover high-achieving students, this might fuel concerns about grade inflation. Some newspapers have called for greater political attention for students who do not attain the highest grades[19]; given the media's agenda-setting role, expanding the range of attainment covered might in turn broaden attention more generally.

In some cases, results were used as a lens through which complex social phenomena could be explored. Most notably, the "gender" topic contained words like "performance", "percent" and "result". Hence, despite issues of gender in education being complex, news coverage appeared to relate primarily to whether boys or girls received better results. The use of results to explore complex topics could be positive: without the 'hook' of results, the topic may not otherwise be explored. However, simplifying complex topics to "who did better?" might obscure more subtle and important stories. Indeed, oversimplification of complex educational issues has been criticised previously (e.g. Mansell, 2013).

There was also increasing usage of exam board and regulator names, whilst coverage of the "exam boards and regulation" topic increased. This could indicate improved engagement with the exam system, or effective exam board communication. However, given the negative sentiment scores for exam-related topics, the increased coverage could actually be linked to growing criticism. Although there was no overall change in use of terms such as "error" or "mistake" (occurrences that might bring exams into the news), growing scrutiny of the system might be responsible for the observed patterns. Notably, the "grade boundaries and marking" topic was heavily covered in 2012 when GCSE English pass rates declined. This suggests that the most attention paid to exam processes was when a problem was

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[19] See, for example, The Guardian view on the new GCSEs: missing the point. (2017, August 24). *The Guardian*. https://www.theguardian.com/commentisfree/2017/aug/24/the-guardian-view-on-the-new-gcses-missing-the-point, accessed April 9, 2018. See also McInerney, L. (2017, August 26). Exams change but we continue to fail the non-academic. *The Guardian*. https://www.theguardian.com/commentisfree/2017/aug/26/the-numbers-still-dont-add-up-for-less-able-gcse-pupils, accessed April 9, 2018.

perceived to have occurred. A challenge for exam boards and the regulator is therefore to ensure that increased coverage does not focus solely on problems.

A final pattern relates to the subjects covered. There was heavy focus on maths and English: English had its own topic, the "core skills" topic focused on literacy and numeracy, and usage of "English" and "maths" increased over time. There were also separate "history", "science", and "languages" topics. Coverage therefore appeared to focus on 'traditional' subjects. Meanwhile, the "subject choice" topic peaked during periods of reform, suggesting that wider discussion of subjects primarily occurred when the system was being changed. It has been suggested that politicians can appeal to voters with a 'back-to-basics' approach in education (Thomas, 2003), whilst sections of the press can be critical of 'soft' subjects[20] (Warmington & Murphy, 2007); results here might reflect such processes. Whatever the underlying reasons though, it appears that the full breadth of the curriculum available at GCSE might not make it into the news.

Standards, criticism and reform
Previous analyses have shown a key theme in exam coverage is criticism of 'declining standards', with 'grade inflation' a particular concern (Warmington & Murphy, 2004, 2007). Such criticism was found here, with "standard" and "slip" (i.e., "slipping standards") occurring relatively frequently, but declining over time. Meanwhile, "dumb down" peaked in the late 2000s and "grade inflation" peaked in the early-to-mid-2010s. Hence, although criticism of standards has always been part of coverage of GCSEs, it does not appear to be worse than when the qualification was launched. Moreover, some concerns may have been addressed to some extent (e.g., grade inflation addressed by the introduction of comparable outcomes).

There appeared to be a contradictory element to coverage of standards. "Slipping standards" were a long-term concern, but the biggest decline in sentiment was associated with declining GCSE English passes in 2012[21]. Hence, both rising and falling grades can be perceived to be undesirable, with rising grades taken to indicate that standards are slipping, but falling grades taken to indicate that the system is unfair. This could simply reflect diverse opinions about the purpose of GCSEs (e.g. Baker, 1994), meaning that some criticism is unavoidable. However, it could also imply that there is insufficient understanding of processes involved in marking and awarding, leading to distrust whenever outcomes change. Therefore, engaging with the public about the exam system, in particular providing clear information about processes involved in marking and awarding, might help to improve perceptions[22].

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[20] See, for example, Harris, S. (2011, May 7) Government to crackdown on the 'Mickey Mouse' GCSEs introduced by Labour. *Daily Mail*. http://www.dailymail.co.uk/news/article-1384470/Crackdown-soft-GCSEs-introduced-Labour.html, accessed April 9, 2018. See also Woods, J. (2012, February 1) Begin your hairdressing papers now..." *telegraph.co.uk*. https://www.telegraph.co.uk/education/9052347/Begin-your-hairdressing-papers-now....html, accessed April 9, 2018.

[21] See, for example, GCSE results 2012: row erupts over marking of English exam papers (2012, August 23). *The Daily Telegraph*. https://www.telegraph.co.uk/education/secondaryeducation/9494605/GCSE-results-2012-row-erupts-over-marking-of-English-exam-papers.html, accessed April 9, 2018. See also Vasagar, J. (2012, August 22). English GCSEs marked down to curb grade inflation, say teachers. *The Guardian*. https://www.theguardian.com/education/2012/aug/22/english-gcses-marked-down-teachers, accessed April 9, 2018.

[22] Exam boards often provide clear explanations of the processes involved in the examinations system. See, for example, *Explaining Examining*, published by OCR, http://www.ocr.org.uk/about/explaining-examining/, accessed August 6, 2018. The challenge may therefore be to ensure that these messages are being seen and understood.

Results here question the view that criticism is getting worse (Newton, 2005). The most negative sentiment occurred in 1988–89, and although the sentiment score declined from 2000 (excluding the sharp drop in 2012), it remained more positive than in the earliest years. Further, the "criticism of the education system" topic declined over time. However, several caveats must be considered. As the total number of articles increased over time, the "criticism of the education system" topic could have appeared to decline, even if the number of articles attributed to it remained similar. Further, as a simple numeric metric was used, critical language could have become more extreme, but this would not have been picked up. Finally, positional context was not accounted for, so, for example, a front page critical story could have been 'balanced out' by a positive story buried inside the paper. However, despite these caveats, results indicated that overall sentiment was not as negative as expected. This is not without precedent: Shannon (2005) rated press 'judgements' about A levels as 'defence, 'praise or 'criticism': defence and praise grouped together outnumbered criticism. Similarly, Hargreaves et al. (2007) found that coverage of teachers was not as negative as perceived, with "…hammering and haranguing of teachers … a feature of media coverage in earlier times, particularly in the 1980s" (p. 60). Therefore, although some topics were associated with negative sentiment (notably the exam system), taken as a whole, GCSEs may be covered more positively now than following their introduction.

A potential outcome of criticism of the education system is that reforms may be proposed to solve the apparent problems. "Introduction of GCSEs" was the largest topic in 1988–1997, whilst "the Diploma" was the largest in 1998–2007. In 2008–2017, the "Gove reforms", "qualification reforms (general)" and "reformed grades" topics were the third, fourth and fifth largest respectively; if grouped as a single "reform" topic, it would have been the largest that decade. Again, it is unclear which came first: press coverage can reflect political focus on reforms, or critical coverage can be used to justify the need for reforms (Baker, 1994; Blackmore & Thorpe, 2003; Thomas, 2003). Intriguingly, however, most topics linked to reforms were associated with negative sentiment, which might indicate that the reforms themselves were not well received. Alternatively, the negative sentiment might reflect criticism of the system, which is used to justify the need for reform. Whilst this analysis cannot further examine the relationship between press coverage and education reforms, it is clear that GCSEs have always been covered in the light of reforms.

Caveats
Several key caveats apply to the results. First, the composition of the sample changed over the years studied. In part, this reflects the changing nature of the press, most notably the growth of online sources. It also reflects the fact that the database from which the corpus was constructed did not include all sources for all years. However, most major sources were present from the start, notably *The Guardian*, *The Times* and *The Independent* (the *Daily Mail* was present from 1992). Analysis of these sources separately (not shown) suggested no substantial difference from overall results. For example, the sentiment dip in 2012 might have been driven by inclusion of articles from *telegraph.co.uk*, but *The Guardian* also showed the dip. If the corpus was restricted to years for which all sources were available, or to sources available for all years, conclusions would be severely limited. Therefore, although the changing composition must be considered, it did not appear to strongly affect results.

Another consideration is that, beyond identifying topic meanings, little human interpretation was used. Analyses involved numeric metrics, which could not take into account subtleties

and complexities of language. Sentiment analysis was particularly affected by this: whilst a simple balance of positive and negative words could be calculated, complex sentiments could not be assessed[23]. Equally, words not in the sentiment dictionary could not be evaluated, even if a human could easily interpret them (e.g., the "Mickey Mouse subjects" referenced in Footnote 23). Further, article structure and weights attributed to viewpoints could not be considered: articles can be structured to give greater prominence to critical viewpoints (Baker, 1994), and extremely polarised opinions can be presented (Warmington & Murphy, 2007). Accordingly, as far as possible, interpretation of sentiment focused on comparisons and changes over time. However, whilst the analysis provides a quantitative assessment, qualitative work would be required to explore, or 'ground-truth', some results.

A further caveat relates to part of the analysis for which human interpretation was used. Topic analysis was based on statistical associations of words, but meaning was assigned through the researcher's judgement. Most topics made sense, but several had less clear meanings. Further, the number of topics was judged subjectively, as the metrics used did not provide a single 'best' number. These two factors also interacted: with a different number of topics, interpretations would change. Consequently, if another researcher repeated the analysis, differences might emerge. However, unlike traditional content analysis, researcher influences were limited: a coding framework (which must be chosen in advance, and which influences interpretation) was not required and there was no researcher involvement in assigning articles to topics. Further, each topic's top words are provided so that readers can re-interpret topics if they wish. Hence, although subjective judgements were required, the approach reduced researcher involvement relative to traditional content analyses.

Finally, the analysis was carried out shortly after administration of the first reformed GCSEs in 2017. Therefore, it is too early to say what effect the introduction of reformed qualifications has had on news coverage; results pertain only to what has gone before. As the roll-out of reformed qualifications will continue until 2020, it will not be possible to draw conclusions about effects on news coverage for some years. Indeed, the sentiment score was declining at the end of the timeline, so it could be instructive to evaluate sentiment throughout the reform process. It is also possible that sentiment could shift between sources: the move to linear examinations and focus on 'traditional' subjects could improve sentiment in some sources but lead to increased criticism in others. Therefore, results primarily relate to how things were, not how they are.

Conclusions
Various authors have suggested that exam boards should engage closely with the press to improve coverage (e.g. Billington, 2006; Mansell, 2013; Murphy, 2013; Newton, 2005; Simpson & Baird, 2013). The increased coverage of the exam system found here suggests that there is increasing engagement, so the challenge may be to improve the associated sentiment. This might be achieved by clearly explaining processes, so that the system is not seen as opaque or unduly complex; articles about tiering and grade boundaries provide

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[23] For example, the article "Labour snobs let down poor pupils by encouraging them to take 'Mickey Mouse' subjects, says Nicky Morgan", published in the Daily Mail on November 4, 2015, includes the following quote: "*They prided themselves on the ever-rising results. But it wasn't real.*" A simple sentiment analysis could not establish that the second sentence negates the entire positive sentence preceding it.

good examples[24]. Indeed, exam processes are sometimes covered by the media[25], suggesting there is an appetite to understand the system. However, poorly-received processes could be detrimental to trust (Billington, 2006), so as Newton (2005) notes, a balance between understanding and confidence is required.

Some findings suggested that GCSE coverage is inherently contradictory. Individuals and schools attaining good results were praised, but the system itself was criticised. Further, "slipping standards" and "grade inflation" have been part of the discussion since GCSEs were introduced, but a decline in pass rates was associated with the sharpest decline in sentiment observed. This could reflect a diversity of public opinion or political leanings (Baker, 1994): different sections of society want different things from GCSEs. Alternatively, it might simply be a regular feature of reporting on education, with Warmington and Murphy (2007) describing the "Jekyll and Hyde nature" of A level coverage. However, open discussion of certain aspects of the system, such as the blogs referred to in Footnote 24, might be one way to help clarify these issues and, in turn, allay the concerns that can lead to apparent contradictions in coverage.

The results presented here could be strengthened (or, indeed, challenged) by further work. A detailed examination of article sentiment could clarify the accuracy of this report's sentiment analysis. Qualitative analysis could also help to examine links between policy and press coverage, as this study noted several instances where it was unclear which drove which. Similarly, links between news coverage and perceptions of GCSEs could be further examined. It would also be instructive to repeat analyses further through the reform process to monitor the changing sentiment. Finally, the same questions could be asked about A levels or vocational qualifications, or new questions could be asked of different sources of data (e.g., education blogs, research reports, speech transcripts), to understand how general this study's findings are.

To conclude, news coverage of GCSEs centres on the annual exam cycle. Results are the biggest event in the cycle, dominating coverage overall. As a consequence, GCSEs are closely linked to final exams. Other key parts of coverage relate to the release of performance measures derived from results, and on big events such as reforms. The sentiments expressed may not be as negative as expected, perhaps linked to coverage of individuals and schools gaining good results. However, it may be a concern for exam boards and the regulator that topics related to exams produced some of the lowest sentiment scores, whilst declining sentiment in more recent years may also be a cause for concern. Against expectations, the biggest decline in sentiment was associated with a *decline* in pass rates, suggesting that it is important to ensure that exam system processes are understood by the public. It is too early to evaluate impacts of recent reforms, but by examining thirty years of press coverage, this research has been able to establish some of the key themes in the public discourse around GCSEs since their introduction.

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[24] See Bramley, T. (2018, February 21). *Method in the madness: the logic that means you can pass GCSE maths with 13 per cent*. https://www.tes.com/news/school-news/breaking-views/method-madness-logic-means-you-can-pass-gcse-maths-13-cent, accessed April 9, 2018. See also Jadhav, C. (2017, November 3). *GCSE maths grade boundaries*. https://ofqual.blog.gov.uk/2017/11/03/gcse-maths-grade-boundaries/, accessed April 9, 2018.

[25] See, for example, Coughlan, S. (2017, August 24). *How can GCSEs get harder and results stay the same?* http://www.bbc.co.uk/news/education-41041595, accessed April 9, 2018.

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Appendix

This appendix contains tables and figures that are discussed in the main report, but which are based on only subsets of the main corpus. This includes specific results for broadsheets, tabloids, and the specialist press, as well as results showing monthly changes. No specific interpretation is provided; for general interpretation of analyses, including some discussion of these results, see the main report.

Figure A1: Word cloud for broadsheets

Figure A2: Word cloud for tabloids

Figure A3: Word cloud for the specialist press

Figure A4: Sentiment word cloud for broadsheets

Figure A5: Sentiment word cloud for tabloids

Figure A6: Sentiment word cloud for the specialist press

Table A1: Top 30 most common words for each month, aggregated over all years, by total count

| January word	count	February word	count	March word	count	April word	count	May word	count	June word	count
school	7,062	school	3,747	school	3,336	school	2,015	school	3,275	school	3,622
gcse	3,381	gcse	2,583	gcse	2,156	gcse	1,657	gcse	2,335	gcse	3,093
pupil	3,133	pupil	1,936	pupil	1,574	exam	1,201	exam	2,093	exam	2,694
year	2,158	year	1,622	year	1,400	pupil	1,046	year	1,587	pupil	2,145
exam	1,561	exam	1,585	exam	1,260	year	991	pupil	1,531	year	1,690
education	1,503	education	1,404	education	905	grade	725	student	1,027	education	1,421
grade	1,450	subject	1,042	student	902	teacher	711	education	1,022	teacher	1,067
subject	1,375	student	997	teacher	859	student	702	child	924	grade	1,062
english	1,345	grade	990	grade	845	education	662	grade	900	student	1,003
percent	1,334	child	923	child	754	child	638	teacher	809	subject	982
table	1,272	alevel	917	percent	748	subject	519	english	715	child	973
result	1,161	teacher	880	english	746	new	514	alevel	712	english	937
maths	1,160	english	858	language	729	make	513	new	694	new	929
teacher	1,072	new	836	subject	691	english	486	up	690	maths	894
child	1,061	up	776	make	651	up	470	study	665	qualification	878
government	1,026	make	762	result	620	study	452	make	656	up	827
student	985	study	754	new	613	work	450	subject	599	make	814
new	942	maths	741	study	599	course	439	work	596	system	789
include	875	course	734	alevel	592	alevel	438	board	547	work	735
make	829	work	654	up	580	science	409	percent	531	percent	718
alevel	818	government	611	course	560	time	408	paper	508	government	679
achieve	788	time	606	science	551	percent	377	course	502	study	675
show	763	qualification	591	work	548	test	376	result	492	gove	662
league	760	percent	585	teach	538	maths	361	maths	487	alevel	645
academy	756	university	582	maths	514	result	348	time	483	paper	627
science	754	teach	564	government	455	language	343	university	468	science	579
up	746	result	562	qualification	455	teach	339	question	462	time	575
course	731	system	554	time	436	high	331	system	460	board	552
qualification	725	science	541	high	406	university	315	include	457	teach	545
good	708	curriculum	515	curriculum	404	paper	305	teach	453	high	529

Table A1 (continued): Top 30 most common words for each month, aggregated over all years, by total count

July word	count	August word	count	September word	count	October word	count	November word	count	December word	count
school	2,655	school	11,316	school	4,855	school	3,581	school	4,624	school	1,925
gcse	1,729	gcse	11,008	gcse	3,662	gcse	2,493	gcse	2,605	gcse	1,505
year	1,277	year	10,205	exam	2,938	year	1,900	pupil	2,218	exam	1,285
pupil	1,202	grade	9,651	year	2,601	pupil	1,736	year	1,799	year	1,102
exam	1,184	exam	7,983	grade	2,518	exam	1,692	exam	1,425	pupil	1,036
education	919	result	6,325	pupil	2,227	grade	1,312	education	1,205	teacher	791
teacher	709	pupil	5,979	education	1,517	education	1,203	grade	1,135	education	702
student	652	percent	5,512	english	1,230	percent	1,067	percent	1,045	grade	582
alevel	612	student	4,540	student	1,206	student	932	teacher	1,010	alevel	551
child	611	english	3,855	result	1,202	alevel	920	student	847	subject	513
subject	578	astar	3,689	percent	1,201	english	910	result	828	student	497
new	553	subject	3,684	subject	1,163	teacher	890	child	770	percent	491
grade	533	education	3,628	teacher	1,143	subject	786	study	746	english	490
up	518	maths	3,415	new	1,038	maths	759	subject	745	study	487
work	509	up	3,091	mark	952	result	754	english	719	board	460
english	485	alevel	3,013	maths	893	government	736	alevel	695	new	450
result	484	pass	2,900	child	887	new	692	government	685	result	433
percent	474	number	2,806	up	865	child	663	high	671	child	429
study	467	teacher	2,622	make	858	up	654	new	654	up	424
qualification	454	high	2,340	study	817	qualification	621	make	650	language	415
maths	452	new	2,326	time	759	make	611	up	596	course	409
course	446	achieve	2,289	alevel	757	language	588	table	581	make	409
make	438	girl	2,250	board	751	work	547	work	570	teach	403
teach	418	study	2,244	qualification	749	study	542	language	545	maths	394
university	401	mark	2,170	system	711	achieve	530	teach	502	system	390
time	369	time	2,131	high	679	number	529	time	490	qualification	370
science	368	university	2,098	work	668	course	516	maths	453	government	341
people	366	make	2,034	standard	659	system	503	girl	437	high	315
government	353	top	2,028	course	653	standard	499	good	421	change	314
board	341	old	2,022	government	642	good	496	standard	420	work	307
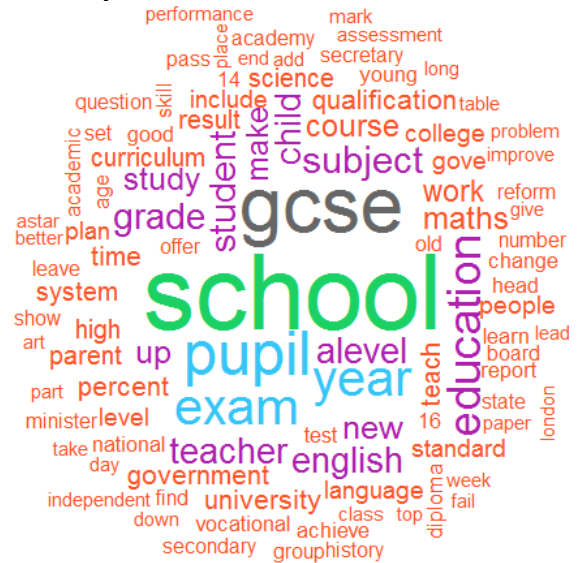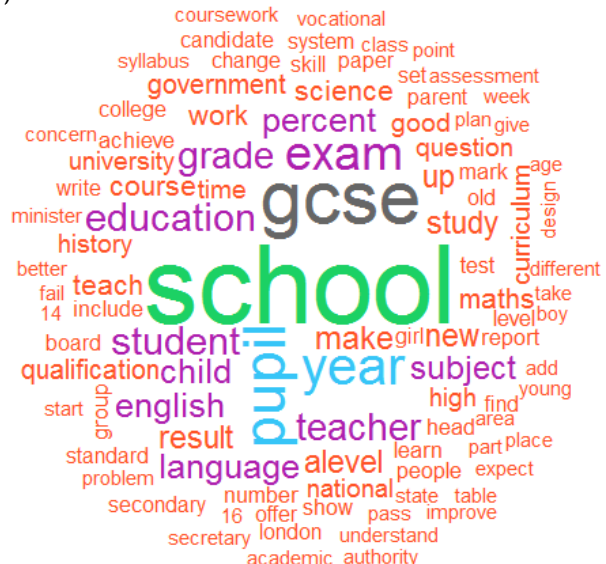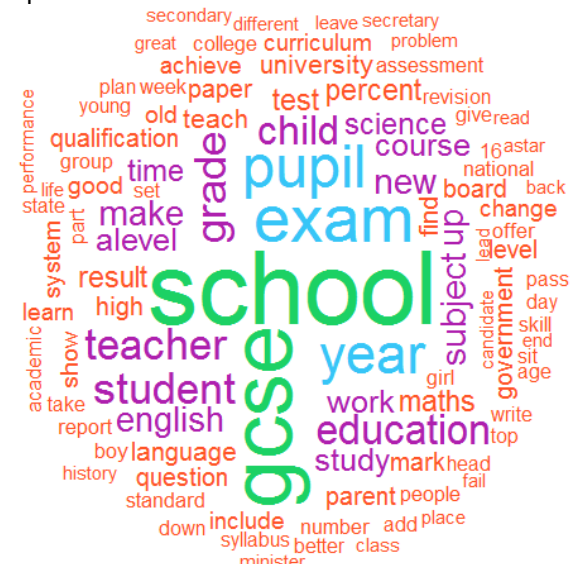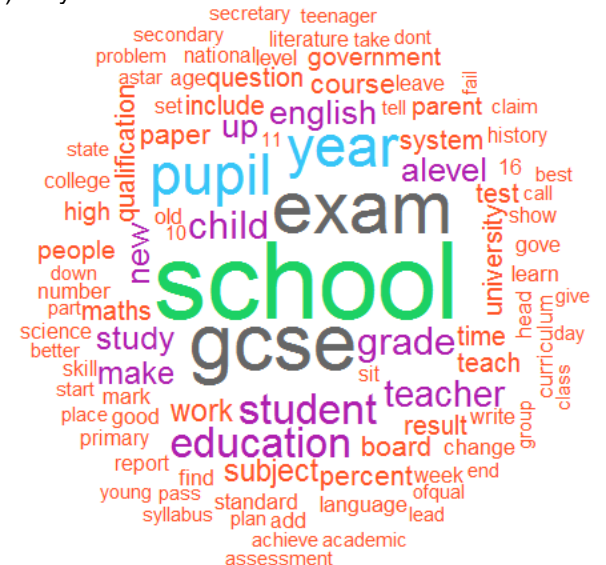
Figure A7: Word clouds for each month aggregated over all years

g) July

h) August

i) September

j) October

k) November

l) December

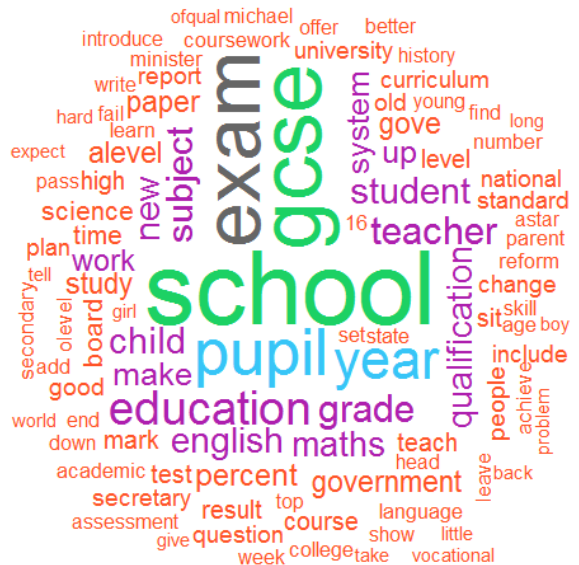*Figure A7 (continued): Word clouds for each month aggregated over all years*

Table A2: Top 30 words for each month aggregated over all years, by the number of articles in which the word occurred

January		February		March		April		May		June	
word	articles	word	articles	word	articles	word	articles	word	articles	word	articles
school	558	school	445	school	368	school	283	school	391	school	492
pupil	529	year	409	year	355	year	261	exam	380	year	489
year	518	pupil	392	pupil	333	pupil	255	year	371	exam	471
education	480	education	385	education	306	exam	249	pupil	355	pupil	450
exam	440	exam	358	exam	293	education	227	education	321	education	435
grade	423	up	328	make	263	make	211	up	303	make	372
subject	406	make	324	grade	261	teacher	196	make	288	up	354
english	394	teacher	311	teacher	247	student	193	student	287	new	348
government	387	grade	306	up	245	up	192	teacher	266	grade	339
make	370	new	304	student	244	new	190	new	257	subject	331
new	369	subject	293	new	243	subject	186	grade	246	teacher	328
maths	369	english	292	subject	232	grade	181	study	236	student	325
result	361	student	287	study	217	time	181	work	234	english	322
teacher	359	government	281	result	214	english	172	english	229	maths	305
include	358	study	278	government	214	study	172	time	226	government	297
up	352	time	275	teach	206	child	155	include	225	time	292
time	327	teach	264	time	206	work	155	subject	225	qualification	291
child	327	high	261	high	204	high	152	alevel	224	study	283
achieve	322	child	258	work	202	teach	148	child	223	child	281
show	321	include	251	child	198	result	145	course	211	work	280
student	319	course	249	english	194	find	139	board	199	system	276
table	319	alevel	248	percent	193	course	137	qualification	198	high	262
good	311	qualification	247	include	187	alevel	135	high	198	old	258
high	303	work	245	alevel	182	level	133	result	197	secretary	250
percent	300	maths	225	number	182	government	131	teach	196	teach	250
secondary	300	system	221	good	181	maths	131	old	189	course	240
number	300	result	219	qualification	180	show	127	government	186	standard	238
league	287	good	218	course	177	good	127	number	184	result	237
alevel	277	standard	217	national	174	percent	126	find	181	good	236
state	275	curriculum	216	achieve	169	test	126	head	180	set	235

Table A2 (continued): Top 30 words for each month aggregated over all years, by the number of articles in which the word occurred

July		August		September		October		November		December	
word	articles	word	articles	word	articles	word	articles	word	articles	word	articles
school	310	year	1,665	school	602	school	445	school	447	school	257
year	291	school	1,619	year	598	year	423	year	425	pupil	247
pupil	272	exam	1,517	exam	562	education	394	pupil	414	year	246
exam	265	result	1,512	pupil	545	pupil	389	education	379	exam	215
education	260	grade	1,494	education	503	exam	372	exam	345	education	215
up	224	pupil	1,407	grade	503	grade	339	grade	300	teacher	192
teacher	202	education	1,253	make	430	government	304	teacher	299	make	191
make	201	up	1,193	result	400	up	296	make	296	up	191
subject	199	student	1,178	up	394	english	294	result	287	subject	172
grade	196	subject	1,134	subject	386	new	288	student	283	new	170
new	196	english	1,100	teacher	385	make	288	government	276	grade	169
work	189	pass	1,043	english	385	teacher	287	up	273	student	168
student	187	number	1,040	student	380	subject	285	child	266	english	167
result	181	time	1,039	new	372	result	267	high	265	government	165
government	179	high	1,035	time	365	student	266	study	264	study	165
time	179	maths	1,025	high	349	work	256	subject	261	teach	162
study	174	make	995	government	326	include	254	time	251	alevel	149
alevel	172	teacher	986	study	321	qualification	251	new	250	course	149
course	168	percent	971	secretary	316	alevel	249	percent	249	result	148
english	167	astar	954	percent	304	time	243	work	244	high	147
child	166	achieve	951	number	302	maths	243	english	241	include	143
high	166	old	922	child	298	number	235	alevel	226	time	142
teach	160	study	885	qualification	298	achieve	234	national	224	change	142
qualification	160	government	884	work	296	high	233	include	222	work	141
university	155	show	881	standard	293	study	226	number	219	system	139
standard	154	alevel	870	mark	290	system	220	teach	217	child	136
people	150	new	867	maths	290	good	218	achieve	215	qualification	135
good	144	work	853	head	285	standard	212	good	214	find	131
maths	143	top	840	system	284	show	212	secretary	214	number	129
old	142	qualification	818	board	284	child	210	show	205	percent	129

Table A3: Top 30 words showing strongest Pearson correlations with the within-article count of "GCSE", for each month aggregated over all years

January word	correl.	February word	correl.	March word	correl.	April word	correl.	May word	correl.	June word	correl.
result	0.436	new	0.355	modular	0.300	science	0.521	stretch	0.311	exam	0.411
table	0.424	grade	0.329	short	0.298	biology	0.513	course	0.281	new	0.385
pupil	0.394	exam	0.317	optional	0.280	range	0.501	mathematics	0.278	olevel	0.368
league	0.368	maths	0.310	clear	0.280	syllabus	0.498	subject	0.268	course	0.362
school	0.366	extension	0.289	unit	0.279	observation	0.497	practice	0.261	pupil	0.348
include	0.364	current	0.281	industry	0.275	objective	0.491	head	0.260	qualification	0.343
equivalent	0.359	scale	0.255	early	0.272	aspect	0.489	10	0.256	year	0.341
english	0.355	replace	0.251	relevant	0.270	assess	0.487	emphasis	0.247	english	0.329
grade	0.347	subject	0.246	base	0.267	information	0.486	answer	0.246	set	0.298
secondary	0.341	work	0.243	structure	0.265	earn	0.486	st	0.243	system	0.294
top	0.331	system	0.243	explain	0.261	broad	0.482	structure	0.243	end	0.294
point	0.331	basic	0.242	study	0.259	design	0.476	concentrate	0.240	easy	0.284
less	0.324	change	0.239	dr	0.252	short	0.474	guide	0.240	document	0.282
astar	0.322	standard	0.239	source	0.251	course	0.474	spread	0.235	current	0.280
government	0.318	intend	0.239	picture	0.250	make	0.474	brand	0.233	change	0.276
performance	0.316	up	0.239	criterion	0.249	criterion	0.471	ofqual	0.231	prepare	0.275
achieve	0.313	english	0.239	revise	0.249	core	0.470	english	0.221	study	0.266
percent	0.305	assessment	0.232	build	0.248	subject	0.469	short	0.220	reform	0.261
bottom	0.302	end	0.230	period	0.248	part	0.458	revise	0.213	biology	0.261
compare	0.299	propose	0.229	1	0.247	include	0.458	concern	0.212	maths	0.260
subject	0.297	level	0.228	exam	0.246	double	0.455	academically	0.212	concern	0.259
show	0.286	foundation	0.226	understand	0.243	recognise	0.450	exam	0.211	standard	0.259
maths	0.282	introduce	0.219	entry	0.242	reference	0.446	pupil	0.211	league	0.259
qualification	0.282	opt	0.218	subject	0.242	data	0.446	section	0.208	complex	0.258
perform	0.280	revamp	0.216	investigate	0.241	aim	0.446	few	0.206	grade	0.256
state	0.280	alevel	0.215	question	0.238	check	0.444	glenys	0.202	number	0.256
ranking	0.278	qualification	0.213	student	0.237	scientific	0.442	prepare	0.201	bring	0.251
year	0.275	pupil	0.213	main	0.237	lead	0.435	deal	0.200	education	0.244
number	0.268	16	0.213	finding	0.236	ability	0.426	sit	0.199	international	0.240
percentage	0.265	criterion	0.210	show	0.236	carry	0.426	review	0.199	up	0.240

Table A3 (continued): Top 30 words showing strongest Pearson correlations with the within-article count of "GCSE", for each month aggregated over all years

July		August		September		October		November		December	
word	**correl.**	**word**	**correl.**	**word**	**correl.**	**word**	**correl.**	**word**	**correl.**	**word**	**correl.**
2	0.313	english	0.508	pupil	0.382	english	0.245	exam	0.330	qualification	0.285
easy	0.304	grade	0.480	olevel	0.338	government	0.239	high	0.306	international	0.281
professor	0.304	maths	0.471	exam	0.285	alternative	0.231	grade	0.272	peter	0.274
range	0.283	pupil	0.433	grade	0.281	qualification	0.228	gain	0.270	alevel	0.273
olevel	0.281	new	0.418	new	0.260	year	0.225	year	0.264	study	0.254
qualification	0.279	year	0.413	year	0.256	result	0.216	tier	0.262	include	0.250
difficult	0.279	achieve	0.407	question	0.252	half	0.214	headmistress	0.259	igcse	0.243
dr	0.278	literature	0.405	little	0.251	achieve	0.214	system	0.257	gain	0.240
demand	0.275	exam	0.394	top	0.248	inflation	0.212	score	0.253	full	0.239
explain	0.268	old	0.393	astar	0.244	include	0.210	pupil	0.249	a	0.236
english	0.267	system	0.389	subject	0.238	conclude	0.210	new	0.243	college	0.230
academic	0.267	16	0.386	candidate	0.231	grade	0.207	star	0.241	association	0.225
represent	0.256	7	0.384	content	0.227	maths	0.207	long	0.235	win	0.223
nick	0.248	astar	0.381	time	0.224	good	0.207	17	0.234	table	0.220
worry	0.237	result	0.376	allow	0.221	pupil	0.206	range	0.234	spanish	0.216
choose	0.237	9	0.372	english	0.220	drop	0.201	easy	0.228	engineer	0.212
count	0.235	receive	0.347	different	0.215	modular	0.199	point	0.224	good	0.210
vocational	0.235	subject	0.343	traditional	0.209	employer	0.198	favour	0.220	course	0.206
table	0.233	sit	0.342	percent	0.208	require	0.197	joint	0.220	assessment	0.205
new	0.233	england	0.337	change	0.207	expect	0.195	headmaster	0.219	short	0.204
gain	0.233	down	0.325	syllabus	0.207	scrap	0.187	de	0.219	qca	0.204
figure	0.232	score	0.322	ebaccs	0.207	continue	0.183	average	0.218	level	0.200
intermediate	0.228	compare	0.319	effectively	0.203	subject	0.182	result	0.211	equivalent	0.198
league	0.228	high	0.317	science	0.199	far	0.182	achieve	0.210	alan	0.197
worth	0.227	language	0.314	replace	0.193	recognise	0.176	level	0.209	introduction	0.197
15	0.224	1	0.310	concern	0.192	14	0.175	qualification	0.208	debate	0.192
show	0.223	number	0.309	prepare	0.192	fall	0.174	add	0.207	joint	0.190
literature	0.217	fall	0.305	achieve	0.192	academic	0.174	wide	0.205	focus	0.189
practical	0.211	4	0.305	tough	0.191	policy	0.173	standard	0.205	authority	0.189
political	0.210	director	0.302	structure	0.189	enter	0.173	reform	0.200	line	0.189

Table A4: Top 20 most frequent words assigned as positive for each month, aggregated over all years

January	count	February	count	March	count	April	count	May	count	June	count
good	708	good	391	good	387	good	257	good	358	good	442
top	502	skill	356	skill	279	skill	205	skill	251	skill	409
improve	401	better	260	better	225	top	170	lead	203	top	304
gain	385	improve	252	improve	213	better	164	better	202	better	301
best	363	lead	230	gain	187	lead	146	best	201	lead	239
progress	343	top	230	best	177	great	136	improve	185	improve	238
better	321	best	212	lead	177	best	122	top	167	best	218
lead	290	great	209	top	162	award	118	easy	155	support	206
skill	263	award	175	important	147	improve	105	free	153	easy	205
great	209	support	174	great	144	support	102	great	142	great	192
favour	196	gain	173	easy	139	gain	99	award	141	favour	186
improvement	188	achievement	163	support	132	important	99	support	139	award	183
free	179	success	154	achievement	124	free	93	modern	134	gain	169
modern	172	encourage	145	encourage	119	modern	92	gain	127	modern	161
achievement	164	favour	144	award	110	easy	88	encourage	123	bright	148
success	162	easy	143	clear	110	encourage	88	bright	114	encourage	135
encourage	155	progress	143	success	106	achievement	77	important	113	clear	134
award	150	free	132	favour	104	clear	71	confidence	106	important	128
support	142	bright	127	bright	93	favour	68	success	98	achievement	127
important	133	clear	118	modern	92	success	65	clear	97	free	124

Table A4 *(continued): Top 20 most frequent words assigned as positive for each month, aggregated over all years*

July		August		September		October		November		December	
word	**count**	**word**	**count**	**word**	**count**	**word**	**count**	**word**	**count**	**word**	**count**
good	290	top	2,028	top	597	good	496	good	421	good	228
skill	289	good	1,519	good	535	skill	329	top	408	skill	212
better	168	award	1,203	award	436	improve	253	better	310	better	149
top	152	better	1,196	lead	323	lead	248	improve	260	lead	144
improve	150	gain	1,059	skill	316	gain	240	gain	252	improve	141
best	127	skill	849	better	299	better	211	best	237	award	129
great	123	lead	843	best	295	top	199	lead	235	top	121
lead	121	best	816	gain	286	award	193	great	219	gain	105
award	112	improve	678	improve	246	best	164	skill	204	best	99
support	108	great	615	favour	232	improvement	147	award	169	easy	93
achievement	105	success	602	great	180	favour	142	improvement	167	support	90
important	98	easy	581	important	178	encourage	136	favour	164	favour	84
gain	94	achievement	508	easy	160	progress	128	support	151	achievement	82
clear	85	modern	475	encourage	158	easy	127	achievement	145	encourage	78
easy	84	favour	472	support	158	great	124	progress	137	free	78
success	83	improvement	470	confidence	156	achievement	119	encourage	132	clear	71
encourage	79	important	422	achievement	148	support	119	success	123	great	70
modern	76	encourage	418	bright	142	clear	110	bright	122	progress	61
free	75	clear	404	success	139	modern	102	important	100	improvement	60
bright	74	support	388	free	135	free	93	free	97	modern	60

Table A5: Top 20 most frequent words assigned as negative for each month, aggregated over all years

January		February		March		April		May		June	
word	count	word	count	word	count	word	count	word	count	word	count
fail	564	fail	231	fail	225	problem	147	fail	232	fail	295
fall	267	problem	221	problem	214	fail	143	problem	193	hard	274
problem	223	hard	199	concern	192	hard	119	hard	154	problem	271
poor	219	concern	196	hard	152	concern	113	concern	146	concern	220
concern	209	poor	138	poor	138	fall	88	issue	129	scrap	190
hard	182	fall	135	fall	107	poor	81	poor	125	poor	176
disadvantage	149	scrap	121	issue	107	issue	72	fall	120	fall	127
worst	139	issue	120	difficult	97	difficult	58	difficult	104	disadvantage	119
issue	124	difficult	111	decline	75	disadvantage	55	stress	85	difficult	115
difficult	97	miss	108	miss	72	stress	50	wrong	82	issue	114
miss	96	fear	92	lack	70	wrong	49	risk	80	lose	110
failure	84	lose	78	worry	65	worry	48	lack	79	miss	101
risk	82	critic	75	disadvantage	57	miss	47	miss	72	wrong	98
struggle	79	risk	75	reject	57	break	43	worry	71	failure	88
worse	72	lack	73	wrong	57	fear	42	scrap	70	lack	87
error	69	worry	73	worst	56	limit	40	break	68	error	81
decline	65	wrong	73	fear	55	decline	39	struggle	66	abolish	74
fear	63	failure	70	lose	54	difficulty	39	lose	64	risk	74
wrong	62	break	61	break	52	risk	38	error	61	leak	71
criticise	60	reject	59	worse	47	lack	37	threat	61	fear	70

Table A5 (continued): Top 20 most frequent words assigned as negative for each month, aggregated over all years

July word	count	August word	count	September word	count	October word	count	November word	count	December word	count
fail	163	fall	1,526	fail	366	fail	257	fail	232	concern	176
problem	161	hard	952	concern	309	problem	224	poor	172	fail	105
concern	126	fail	909	problem	300	concern	199	concern	153	fall	105
hard	118	concern	643	fall	230	fall	194	hard	137	hard	97
issue	88	decline	535	hard	217	poor	158	problem	131	problem	93
poor	81	problem	515	poor	173	hard	146	fall	116	poor	87
lack	62	poor	411	issue	158	scrap	111	issue	93	issue	76
difficult	61	issue	334	miss	150	issue	103	difficult	84	cheat	59
fall	61	miss	325	difficult	138	cheat	83	worst	80	fear	56
failure	58	difficult	322	scrap	127	decline	83	disadvantage	79	lack	52
fear	56	failure	289	decline	125	difficult	75	miss	73	difficult	51
worry	55	worry	281	wrong	108	wrong	74	decline	66	decline	50
stress	51	wrong	264	limit	102	risk	73	limit	65	miss	50
lose	49	struggle	244	worry	100	fear	65	fear	64	struggle	48
disadvantage	48	fear	243	failure	91	worry	63	wrong	64	disadvantage	46
break	44	lose	240	struggle	91	miss	60	lack	63	error	44
scrap	44	break	210	fear	88	limit	56	failure	58	scrap	41
wrong	39	scrap	202	lose	82	struggle	56	scrap	57	allegation	39
error	38	disadvantage	194	lack	80	break	54	lose	53	worry	38
miss	38	lack	190	risk	77	failure	54	risk	51	break	36

a) January

b) February

c) March

d) April

e) May

f) June

Figure A8: Sentiment word clouds for each month, aggregated over all years

(continued on next page)

g) July

h) August

i) September
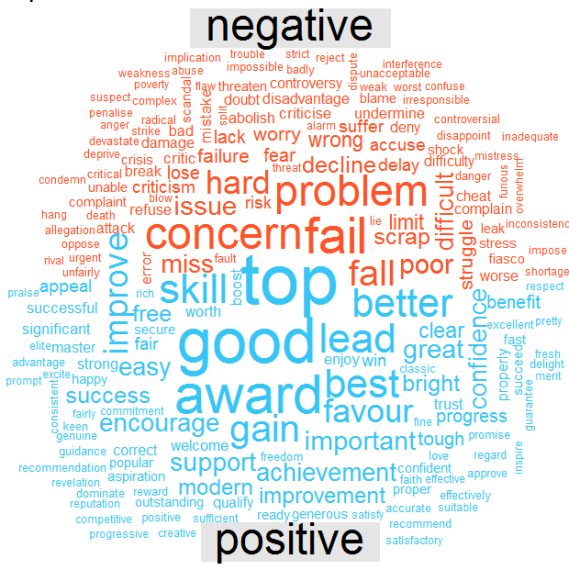
j) October

k) November

l) December

Figure A8 (continued): Sentiment word clouds for each month, aggregated over all years

Table A6: Sentiment summaries for each month, aggregated over all years

Month	Sentiment	No. assigned words	% assigned words	% total words	No. articles	% articles	Mean sentiment (± SD)
January	Negative	8,196	43.9%	4.6%	193	32.5%	-7.45 (± 6.638)
	Positive	10,494	56.1%	5.8%	376	63.4%	9.94 (± 12.895)
	Neutral	–	–	–	24	4.0%	–
February	Negative	7,947	47.0%	5.1%	191	39.7%	-7.53 (± 7.242)
	Positive	8,952	53.0%	5.8%	272	56.5%	8.99 (± 8.256)
	Neutral	–	–	–	18	3.7%	–
March	Negative	6,186	46.3%	4.8%	159	39.9%	-7.98 (± 8.203)
	Positive	7,177	53.7%	5.6%	221	55.5%	10.23 (± 11.091)
	Neutral	–	–	–	18	4.5%	–
April	Negative	4,636	47.1%	4.8%	129	41.0%	-7.88 (± 6.474)
	Positive	5,202	52.9%	5.4%	169	53.7%	9.37 (± 10.396)
	Neutral	–	–	–	17	5.4%	–
May	Negative	6,953	48.9%	5.1%	210	46.2%	-8.49 (± 11.280)
	Positive	7,278	51.1%	5.3%	225	49.5%	9.37 (± 11.519)
	Neutral	–	–	–	20	4.4%	–
June	Negative	9,142	49.3%	5.4%	250	44.0%	-8.16 (± 7.833)
	Positive	9,408	50.7%	5.6%	292	51.4%	7.89 (± 7.181)
	Neutral	–	–	–	26	4.6%	–
July	Negative	4,874	46.0%	4.7%	119	36.1%	-8.53 (± 10.554)
	Positive	5,718	54.0%	5.6%	193	58.5%	9.63 (± 8.587)
	Neutral	–	–	–	18	5.5%	–
August	Negative	25,121	44.2%	4.7%	569	32.3%	-7.14 (± 7.666)
	Positive	31,654	55.8%	5.9%	1,102	62.6%	9.62 (± 10.514)
	Neutral	–	–	–	89	5.1%	–
September	Negative	9,932	47.7%	5.1%	267	39.3%	-8.55 (± 12.198)
	Positive	10,900	52.3%	5.6%	385	56.7%	8.44 (± 7.280)
	Neutral	–	–	–	27	4.0%	–
October	Negative	6,784	46.6%	4.9%	186	39.6%	-7.47 (± 8.909)
	Positive	7,766	53.4%	5.7%	257	54.7%	9.23 (± 8.090)
	Neutral	–	–	–	27	5.7%	–
November	Negative	6,303	42.9%	4.5%	159	33.0%	-7.18 (± 7.635)
	Positive	8,383	57.1%	5.9%	305	63.3%	10.56 (± 9.204)
	Neutral	–	–	–	18	3.7%	–
December	Negative	4,172	47.3%	4.7%	120	41.1%	-7.64 (± 8.14)
	Positive	4,172	47.3%	4.7%	157	53.8%	8.86 (± 8.407)
	Neutral	–	–	–	15	5.1%	–

Table A7: The proportion of articles and of total probability falling into each topic, for each month, aggregated over all years

Note: Table is sorted in order of topic number, with top three topics by proportion highlighted in each month; if multiple topics had exactly the same percentage, more than three can be highlighted. Topics for which the meaning was somewhat unclear are indicated with an asterisk.

| Topic	January % articles	January % prob.	February % articles	February % prob.	March % articles	March % prob.	April % articles	April % prob.	May % articles	May % prob.	June % articles	June % prob.
1. Ethnicity	1.9%	1.7%	2.3%	1.7%	4.5%	2.5%	3.2%	2.2%	0.6%	1.4%	0.5%	1.4%
2. Universities	1.3%	1.7%	1.4%	1.8%	2.0%	2.0%	2.2%	2.0%	1.5%	1.8%	1.2%	1.5%
3. Academies & school governance	**7.9%**	**4.1%**	**4.4%**	2.6%	2.5%	1.9%	1.0%	1.5%	1.8%	1.6%	1.6%	1.7%
4. School performance & improvement	4.2%	3.4%	2.0%	2.0%	2.3%	2.4%	1.0%	2.0%	1.9%	2.0%	1.9%	1.7%
5. Grade boundaries & marking	0.2%	1.2%	2.4%	2.0%	2.0%	2.0%	1.0%	1.6%	2.6%	2.0%	0.7%	1.7%
6. Employment & the workplace	0.8%	1.8%	1.5%	2.3%	2.3%	1.9%	0.6%	1.7%	2.6%	2.0%	2.3%	2.3%
7. The Diploma	2.7%	1.9%	**11.8%**	**4.7%**	4.8%	2.7%	2.2%	1.5%	0.7%	1.6%	3.5%	2.4%
8. A levels & post-16 education	0.5%	1.7%	1.5%	2.2%	0.8%	1.9%	1.0%	2.0%	0.3%	1.9%	0.5%	1.7%
9. Problems at school	2.7%	1.8%	1.9%	1.8%	1.1%	1.6%	1.4%	2.0%	3.1%	2.7%	1.1%	1.7%
10. Results summaries	0.3%	1.9%	0.3%	1.4%	0.0%	1.8%	0.3%	1.6%	0.7%	1.5%	0.0%	1.4%
11. GCSE entries	0.2%	1.7%	0.2%	1.8%	1.8%	2.1%	0.5%	2.0%	1.2%	2.3%	0.7%	2.5%
12. Core skills	1.4%	2.0%	3.1%	2.2%	1.5%	1.8%	2.9%	2.0%	3.6%	2.1%	3.3%	2.5%
13. Revision & miscellaneous time use*	1.8%	1.7%	3.3%	2.2%	2.0%	1.7%	3.7%	**2.7%**	2.8%	2.1%	1.3%	1.7%
14. Personal perspectives	0.7%	1.8%	2.7%	2.5%	0.5%	2.0%	3.5%	**2.6%**	1.5%	2.4%	2.6%	2.5%
15. Personal results stories	0.7%	1.2%	0.4%	1.2%	0.9%	1.2%	1.1%	1.2%	0.3%	1.2%	0.4%	1.2%
16. Tragedies & problems	0.9%	1.3%	1.3%	1.4%	1.3%	1.6%	2.9%	2.1%	3.7%	2.4%	4.6%	2.9%
17. Exam boards & regulation	1.4%	1.6%	1.8%	1.7%	0.6%	1.9%	3.6%	2.5%	3.7%	**3.0%**	1.1%	1.9%
18. Targets & results	**6.2%**	**4.3%**	1.7%	2.1%	2.0%	2.6%	1.3%	2.4%	1.8%	2.0%	1.4%	1.9%
19. Vocational qualifications	4.9%	2.6%	3.3%	2.5%	2.5%	2.2%	3.8%	2.2%	3.3%	2.0%	1.9%	2.1%
20. Poor results*	0.5%	1.3%	0.8%	1.6%	0.5%	1.6%	0.2%	1.2%	0.3%	1.4%	0.0%	1.2%
21. Religion & religious education	0.3%	1.3%	1.0%	1.9%	1.0%	1.5%	1.9%	1.9%	0.7%	1.6%	1.1%	1.5%
22. Curriculum & syllabus content	2.6%	2.1%	1.9%	2.5%	1.8%	2.3%	2.2%	2.6%	1.0%	2.0%	1.1%	2.0%
23. Teaching	0.6%	1.8%	0.4%	2.0%	0.0%	2.0%	1.0%	2.0%	0.4%	1.8%	0.9%	1.9%
24. Coursework & assessment methods	2.0%	1.6%	0.9%	1.7%	0.9%	1.8%	1.4%	2.0%	1.9%	1.9%	3.5%	2.4%
25. Criticism of the education system	1.4%	1.9%	2.1%	2.3%	0.0%	1.7%	0.6%	1.8%	0.7%	1.8%	1.9%	2.2%

Table A7 (continued): The proportion of articles and of total probability falling into each topic, for each month, aggregated over all years

Topic	January		February		March		April		May		June	
	% articles	% prob.	% articles	% prob.	% articles	% prob.	% articles	% prob.	% articles	% prob.	% articles	% prob.
26. Gove reforms	1.4%	2.0%	**7.5%**	**3.6%**	0.6%	1.8%	0.3%	1.5%	0.4%	2.0%	**9.8%**	**4.7%**
27. Independent schools	3.4%	2.6%	2.4%	2.0%	2.3%	2.0%	1.9%	1.7%	1.2%	1.6%	2.7%	2.1%
28. Qualification reforms (general)	0.6%	2.0%	1.3%	2.6%	3.3%	2.6%	3.0%	2.6%	3.3%	2.7%	**6.9%**	**3.6%**
29. League tables	**11.1%**	**5.3%**	1.3%	1.8%	2.0%	1.9%	2.2%	1.7%	0.9%	1.6%	1.2%	1.8%
30. Exam papers, questions & marking	1.2%	1.3%	0.9%	1.4%	2.6%	1.8%	1.6%	2.0%	**7.8%**	**3.4%**	**7.7%**	**3.4%**
31. Parental involvement & families	1.0%	1.8%	2.3%	2.2%	2.6%	2.1%	2.2%	2.4%	1.7%	2.1%	0.7%	1.8%
32. Subject choice	2.9%	2.9%	3.3%	**2.7%**	2.0%	2.1%	1.9%	1.9%	1.1%	1.6%	3.2%	2.3%
33. Gender	1.2%	1.3%	0.4%	1.2%	1.6%	1.5%	1.9%	1.6%	0.9%	1.1%	1.6%	1.4%
34. Inspections	2.5%	2.3%	2.3%	1.9%	**6.3%**	**3.6%**	0.6%	1.6%	1.9%	1.9%	3.1%	2.0%
35. Learning methods & technology	2.5%	1.7%	0.6%	1.8%	1.8%	1.8%	3.8%	**3.1%**	3.4%	2.6%	0.7%	1.4%
36. Money & finances	0.5%	1.4%	1.0%	1.9%	0.5%	1.7%	2.9%	2.3%	1.5%	1.9%	1.9%	2.0%
37. Practical skills, media & social media*	0.5%	1.0%	1.9%	1.7%	0.8%	1.4%	**4.4%**	2.2%	**4.2%**	2.8%	2.3%	1.8%
38. Countries of the UK	0.8%	1.4%	0.6%	1.2%	1.0%	1.5%	1.3%	1.3%	0.7%	1.4%	1.1%	1.7%
39. Research reports	0.5%	1.7%	1.1%	1.8%	1.3%	2.3%	2.4%	2.4%	1.3%	2.1%	1.1%	1.9%
40. Reformed grades	1.3%	1.8%	0.6%	1.6%	2.3%	1.7%	**4.1%**	2.5%	3.7%	2.0%	1.9%	2.2%
41. Science	2.4%	1.8%	2.1%	1.8%	**5.0%**	2.2%	1.9%	2.0%	0.2%	1.4%	1.6%	1.8%
42. Teaching unions	0.2%	2.0%	0.7%	1.8%	1.3%	2.2%	2.2%	2.1%	0.0%	1.7%	0.5%	1.9%
43. History	1.4%	1.7%	1.3%	1.8%	4.8%	**2.9%**	2.5%	2.5%	3.9%	2.5%	2.1%	2.0%
44. Profiles of schools, courses & initiatives*	1.4%	1.9%	1.9%	2.2%	1.8%	2.1%	0.6%	1.8%	1.5%	1.9%	0.9%	1.6%
45. Introduction of GCSEs	2.2%	1.8%	3.1%	1.9%	2.8%	1.8%	1.4%	1.8%	2.0%	1.7%	0.9%	1.7%
46. Leaving school & exams at 16*	1.0%	2.0%	0.8%	2.1%	0.5%	1.8%	0.6%	1.8%	1.5%	2.1%	1.1%	2.1%
47. Languages	2.7%	1.7%	2.9%	1.8%	**8.3%**	**3.3%**	**4.5%**	2.3%	1.9%	1.6%	1.9%	1.5%
48. Disadvantage & socioeconomics	3.5%	3.2%	1.7%	2.0%	2.0%	2.2%	3.8%	2.4%	3.5%	2.3%	3.4%	2.6%
49. English	0.3%	1.1%	2.6%	1.6%	3.3%	1.9%	3.2%	2.2%	**9.0%**	**4.7%**	2.4%	2.1%
50. School comparisons	5.7%	3.4%	1.3%	1.5%	0.3%	1.4%	0.6%	1.3%	0.0%	1.2%	0.4%	1.2%

Table A7 (continued): The proportion of articles and of total probability falling into each topic, for each month, aggregated over all years

Topic	July % articles	July % prob.	August % articles	August % prob.	September % articles	September % prob.	October % articles	October % prob.	November % articles	November % prob.	December % articles	December % prob.
1. Ethnicity	0.8%	1.3%	0.2%	1.0%	1.0%	1.3%	1.9%	1.6%	2.7%	2.2%	1.7%	1.9%
2. Universities	1.5%	2.2%	1.9%	1.9%	1.2%	1.8%	1.5%	1.8%	0.5%	1.4%	0.7%	1.6%
3. Academies & school governance	1.8%	1.7%	1.6%	1.6%	1.6%	1.7%	2.5%	2.0%	2.5%	2.2%	1.4%	1.5%
4. School performance & improvement	1.2%	1.8%	1.0%	2.0%	1.0%	1.9%	1.7%	2.4%	3.6%	2.8%	3.1%	2.3%
5. Grade boundaries & marking	1.8%	1.6%	**5.3%**	3.2%	**10.2%**	**5.0%**	3.8%	2.8%	3.3%	2.4%	**4.1%**	**3.1%**
6. Employment & the workplace	1.5%	2.4%	2.6%	2.4%	1.5%	2.1%	0.7%	2.0%	1.5%	1.8%	1.4%	1.9%
7. The Diploma	4.4%	**2.6%**	1.4%	1.4%	1.2%	1.5%	**11.1%**	**4.4%**	2.3%	1.9%	3.1%	2.0%
8. A levels & post-16 education	0.9%	2.1%	1.0%	2.1%	0.7%	1.8%	0.4%	2.1%	0.8%	1.9%	0.7%	2.1%
9. Problems at school	0.9%	1.7%	0.9%	1.4%	0.4%	1.4%	2.3%	1.7%	0.8%	1.6%	0.3%	1.5%
10. Results summaries	1.2%	1.7%	**15.7%**	**6.7%**	1.6%	2.5%	2.4%	2.8%	0.3%	1.8%	0.7%	2.1%
11. GCSE entries	1.8%	2.4%	2.1%	2.7%	1.0%	2.3%	0.6%	1.9%	1.6%	2.0%	0.0%	1.7%
12. Core skills	**4.9%**	2.5%	2.5%	2.1%	3.2%	2.0%	2.0%	2.5%	0.8%	1.6%	3.1%	2.1%
13. Revision & miscellaneous time use*	0.9%	1.5%	0.4%	1.4%	1.8%	1.7%	1.7%	1.4%	0.9%	1.5%	1.2%	1.5%
14. Personal perspectives	2.9%	**2.7%**	2.7%	2.5%	1.3%	2.1%	1.9%	1.9%	0.5%	1.9%	0.7%	1.9%
15. Personal results stories	0.9%	1.5%	**9.1%**	**4.1%**	1.5%	1.5%	0.3%	1.2%	2.4%	1.5%	0.7%	1.3%
16. Tragedies & problems	2.7%	2.1%	2.9%	2.2%	2.2%	1.7%	0.9%	1.3%	1.6%	1.5%	0.3%	1.2%
17. Exam boards & regulation	3.2%	2.5%	1.7%	1.8%	1.1%	2.0%	2.3%	2.1%	1.2%	1.6%	**11.6%**	**5.7%**
18. Targets & results	1.2%	2.2%	2.2%	3.3%	1.0%	2.4%	**9.6%**	**4.5%**	2.5%	**3.1%**	1.7%	2.4%
19. Vocational qualifications	**5.5%**	**3.1%**	2.5%	2.0%	1.6%	1.7%	2.5%	2.4%	1.7%	1.7%	3.9%	2.3%
20. Poor results*	0.3%	1.6%	0.9%	2.1%	1.4%	2.1%	0.0%	1.4%	0.0%	1.3%	0.0%	1.3%
21. Religion & religious education	0.6%	1.3%	0.2%	1.0%	0.7%	1.4%	0.6%	1.4%	**4.8%**	**3.1%**	2.4%	2.1%
22. Curriculum & syllabus content	2.4%	2.4%	0.2%	1.3%	1.5%	2.0%	1.1%	1.9%	2.0%	2.1%	3.3%	2.6%
23. Teaching	2.0%	2.4%	0.4%	1.4%	0.3%	1.7%	0.9%	1.9%	2.0%	2.0%	0.3%	2.2%
24. Coursework & assessment methods	1.2%	1.7%	1.0%	1.6%	1.5%	1.8%	**4.9%**	**2.9%**	2.3%	2.2%	2.2%	2.0%
25. Criticism of the education system	1.8%	2.1%	3.0%	2.1%	2.1%	2.1%	2.1%	1.8%	1.2%	1.7%	1.0%	1.9%

Table A7 (continued): The proportion of articles and of total probability falling into each topic, for each month, aggregated over all years

	Topic	July		August		September		October		November		December	
		% articles	% prob.	% articles	% prob.	% articles	% prob.	% articles	% prob.	% articles	% prob.	% articles	% prob.
26.	Gove reforms	2.1%	2.0%	0.7%	1.6%	7.1%	3.5%	1.2%	2.0%	0.6%	1.7%	3.9%	2.5%
27.	Independent schools	2.4%	2.0%	3.2%	2.1%	5.2%	2.9%	3.7%	2.5%	2.3%	2.0%	1.7%	1.8%
28.	Qualification reforms (general)	1.5%	2.5%	0.8%	1.8%	2.7%	2.6%	1.1%	2.2%	2.4%	2.2%	1.9%	2.8%
29.	League tables	2.4%	1.7%	1.6%	2.1%	1.8%	2.0%	4.3%	2.5%	3.6%	2.8%	1.4%	1.9%
30.	Exam papers, questions & marking	5.0%	2.4%	2.5%	2.0%	3.7%	2.4%	3.6%	2.1%	0.9%	1.6%	3.1%	2.0%
31.	Parental involvement & families	1.8%	2.2%	0.9%	1.5%	1.6%	1.7%	1.1%	1.7%	0.6%	1.8%	1.7%	1.7%
32.	Subject choice	1.8%	1.9%	1.5%	1.9%	3.5%	2.2%	2.1%	2.1%	1.9%	1.8%	2.1%	1.9%
33.	Gender	3.3%	2.0%	2.9%	2.3%	0.9%	1.3%	1.1%	1.5%	1.9%	1.5%	0.7%	1.2%
34.	Inspections	3.3%	2.6%	0.8%	1.4%	0.7%	1.6%	1.5%	2.0%	4.3%	3.0%	1.4%	1.8%
35.	Learning methods & technology	1.7%	1.8%	0.7%	1.2%	0.6%	1.4%	0.9%	1.4%	0.9%	1.5%	1.0%	1.9%
36.	Money & finances	0.3%	1.8%	0.9%	1.5%	1.3%	1.7%	1.6%	1.7%	1.2%	1.7%	2.7%	2.1%
37.	Practical skills, media & social media*	2.0%	1.7%	0.7%	1.2%	2.4%	1.8%	0.9%	1.2%	2.7%	1.6%	1.0%	1.3%
38.	Countries of the UK	0.9%	1.4%	0.6%	1.7%	0.7%	1.8%	1.3%	1.5%	0.3%	1.5%	0.5%	1.7%
39.	Research reports	1.5%	2.2%	0.3%	1.6%	1.2%	2.0%	1.3%	2.2%	0.4%	2.2%	0.7%	2.1%
40.	Reformed grades	0.6%	1.7%	5.2%	3.5%	1.8%	2.3%	0.4%	1.8%	0.9%	1.6%	0.3%	1.3%
41.	Science	2.7%	1.8%	0.9%	1.7%	1.0%	1.4%	1.1%	1.4%	2.7%	1.6%	1.0%	1.5%
42.	Teaching unions	0.3%	2.0%	0.4%	2.0%	0.5%	1.9%	0.2%	1.9%	1.6%	2.3%	0.7%	1.8%
43.	History	3.2%	2.2%	0.7%	1.2%	0.5%	1.5%	0.2%	1.3%	1.9%	1.8%	3.4%	2.4%
44.	Profiles of schools, courses & initiatives*	3.2%	2.4%	0.5%	1.4%	0.9%	1.7%	1.3%	1.8%	2.5%	2.2%	1.7%	1.9%
45.	Introduction of GCSEs	4.9%	2.5%	2.6%	2.0%	7.4%	3.2%	4.7%	2.7%	3.2%	2.2%	3.9%	2.0%
46.	Leaving school & exams at 16*	0.8%	2.0%	0.6%	2.1%	0.7%	2.0%	0.6%	2.0%	0.8%	2.1%	1.0%	2.1%
47.	Languages	1.8%	1.4%	3.0%	2.1%	2.2%	1.8%	3.2%	1.9%	3.3%	1.9%	5.3%	2.5%
48.	Disadvantage & socioeconomics	1.1%	2.0%	0.7%	1.5%	1.5%	1.7%	0.9%	2.0%	3.2%	2.5%	4.1%	2.5%
49.	English	1.8%	1.6%	0.9%	1.2%	1.2%	1.4%	1.7%	1.4%	5.0%	2.4%	2.9%	1.8%
50.	School comparisons	1.2%	1.6%	3.3%	2.5%	6.1%	3.0%	0.6%	1.4%	7.1%	3.8%	2.1%	1.7%
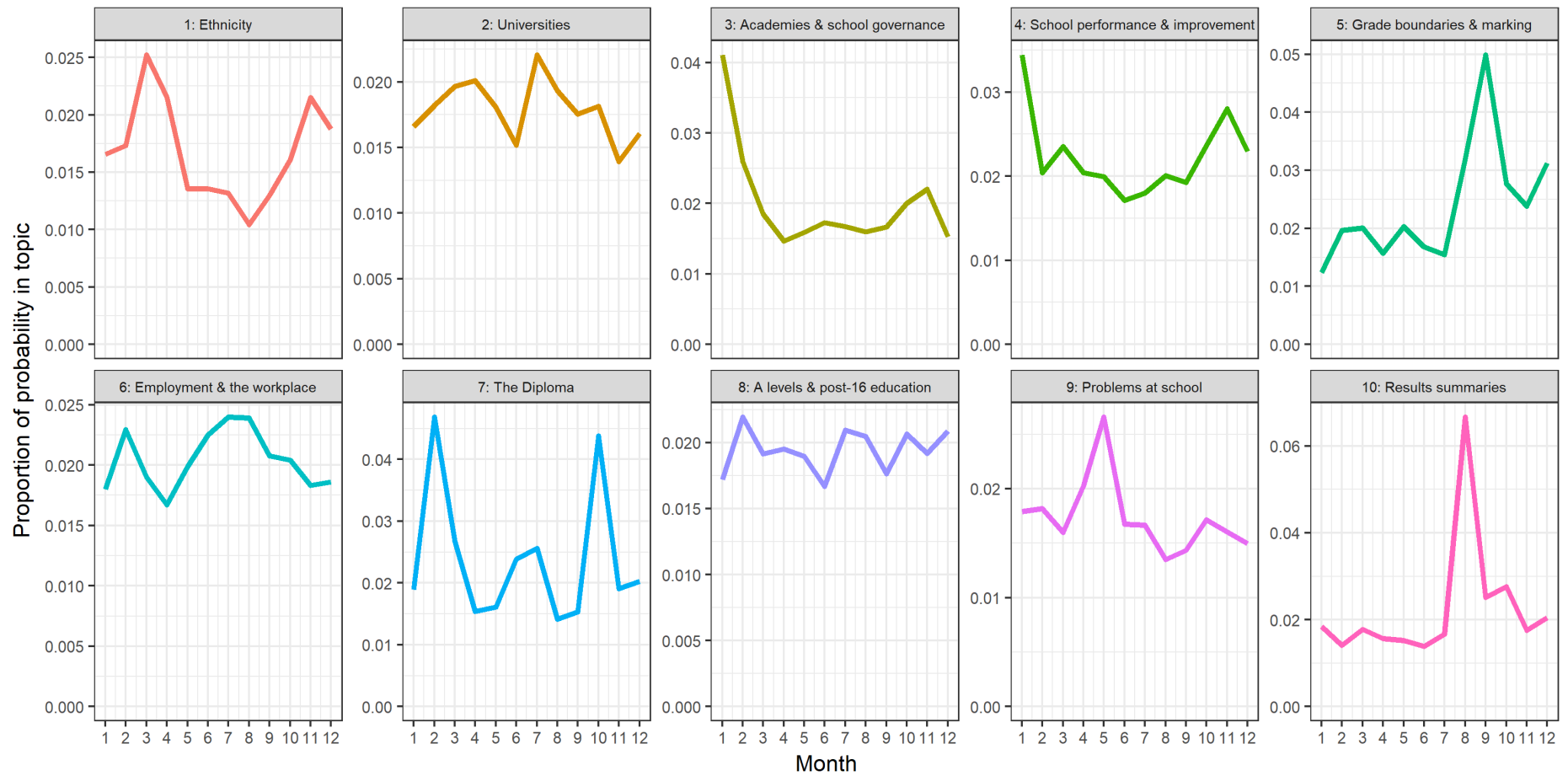
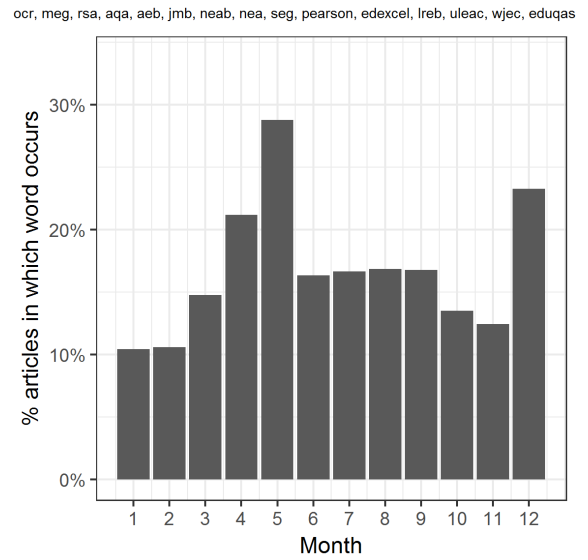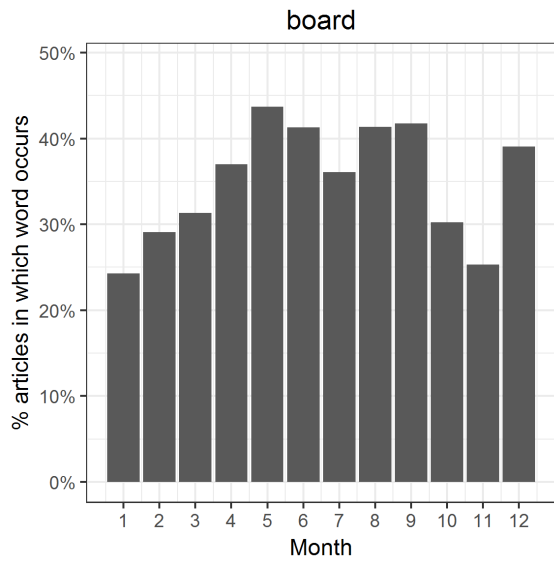***Figure A9: The proportion of probability attributed to each topic for each month, aggregated across all years***

Note: Lines represent the probability attributed to the specific topic each month, divided by the total probability for that month. Hence, the sum of probabilities across all topics each month equals 1. Note that y axes vary between plots to improve visibility. Topics for which the meaning was somewhat unclear are indicated with an asterisk.
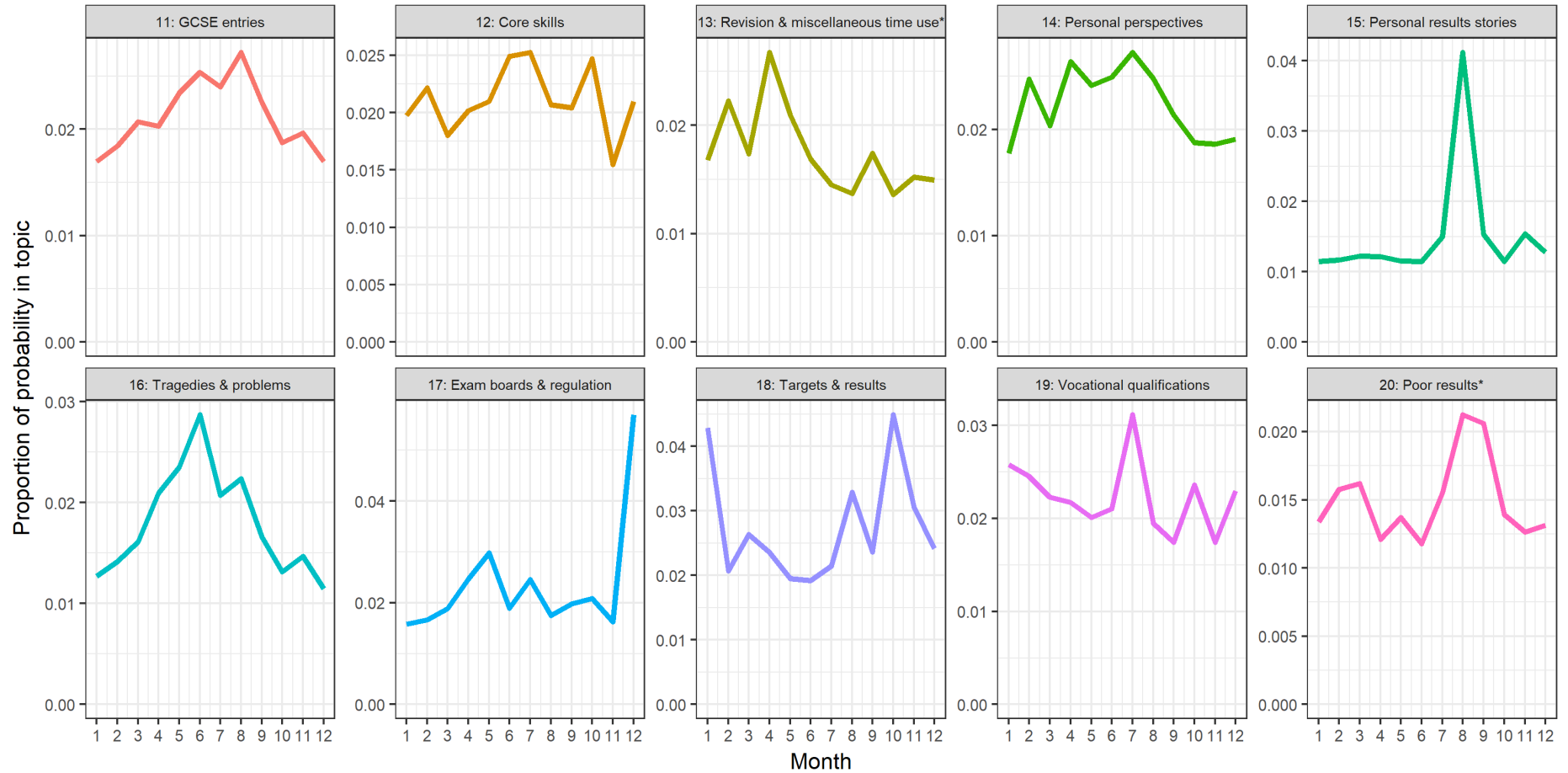
Figure 9 (continued): The proportion of probability attributed to each topic for each month, aggregated across all years
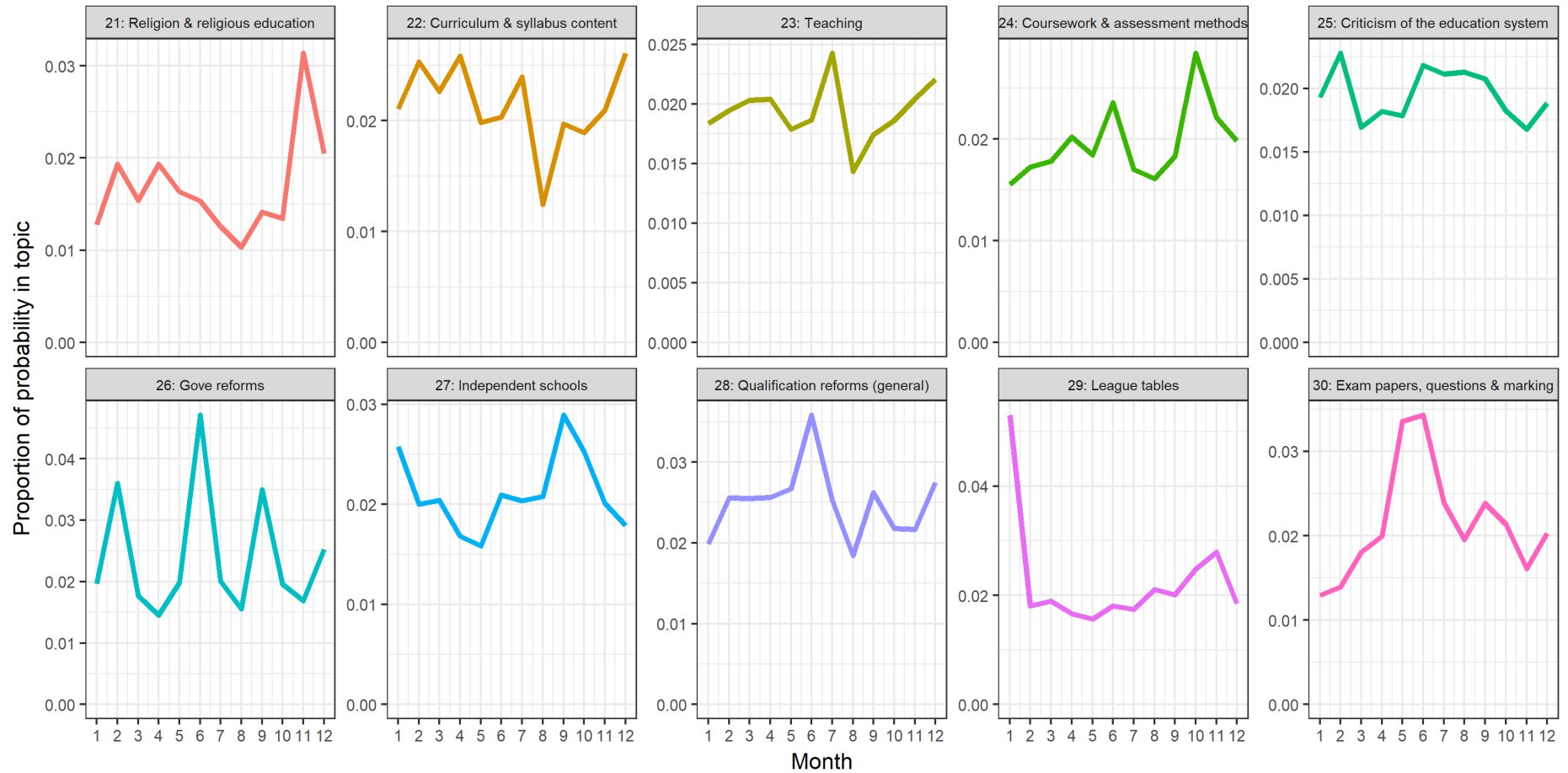
Figure 9 (continued): The proportion of probability attributed to each topic for each month, aggregated across all years
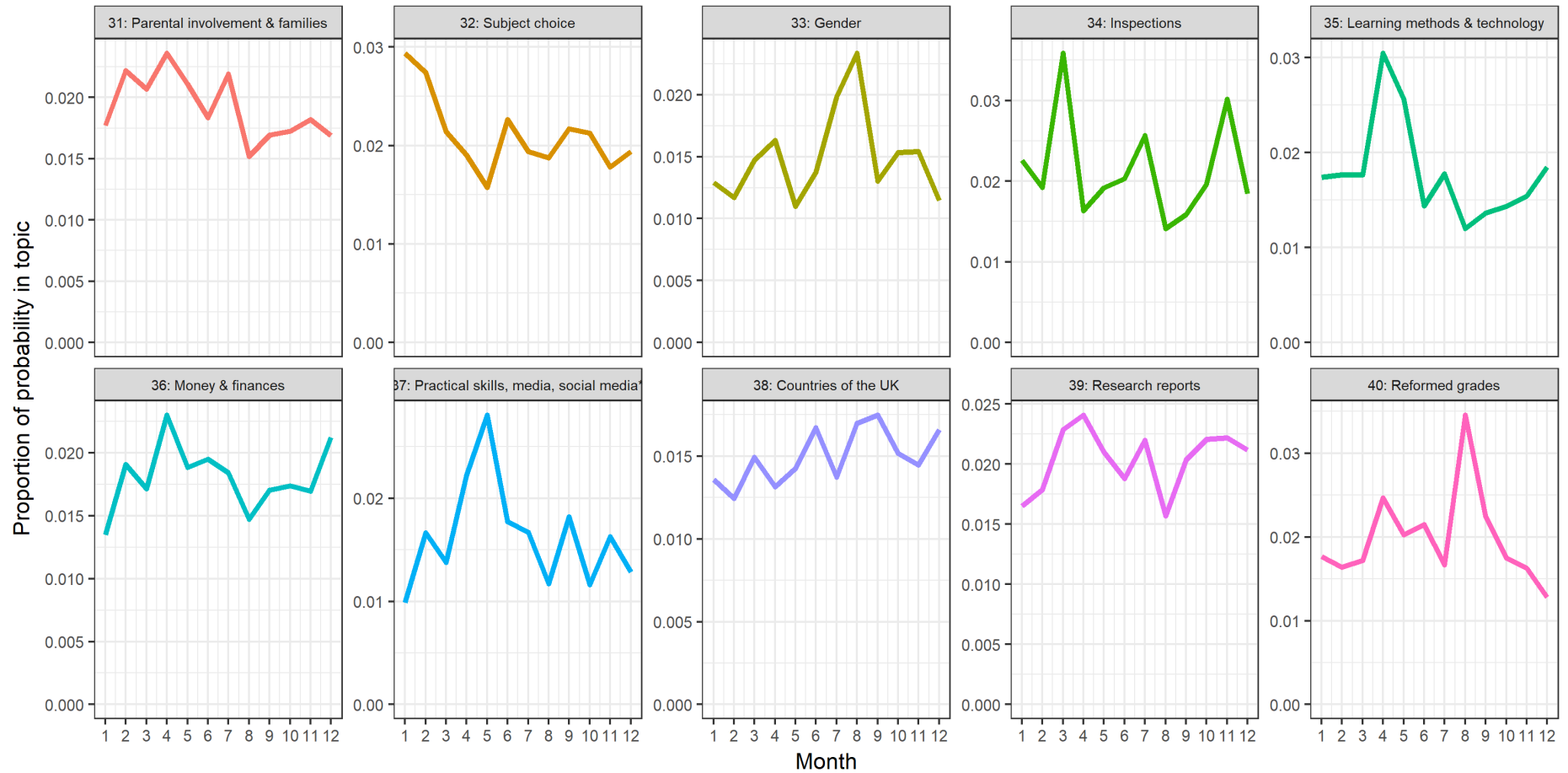
Figure 9 (continued): The proportion of probability attributed to for each topic each month, aggregated across all years
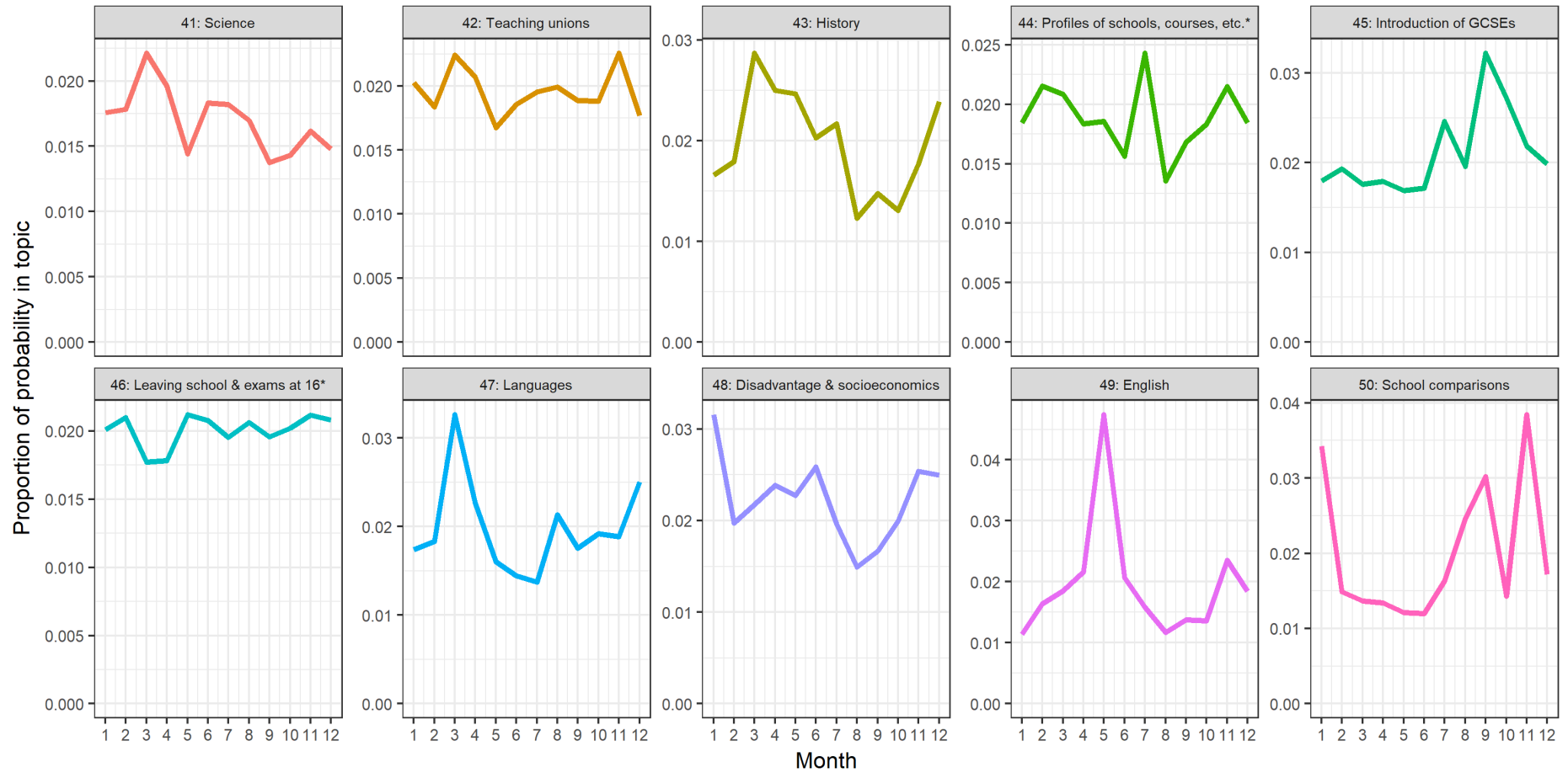
Figure 9 (continued): The proportion of probability attributed to each topic for each month, aggregated across all years

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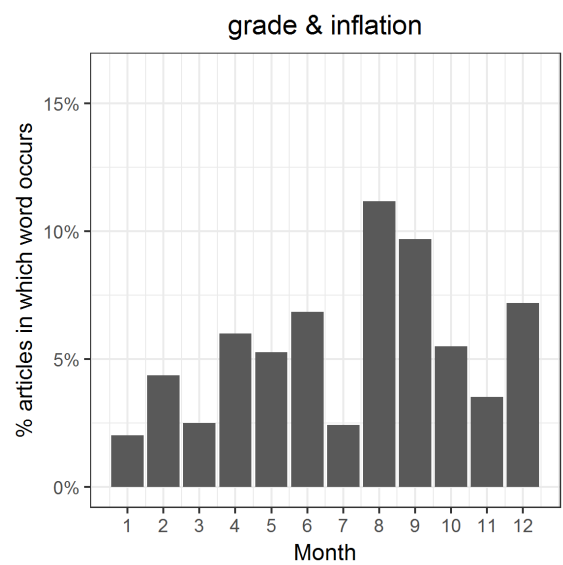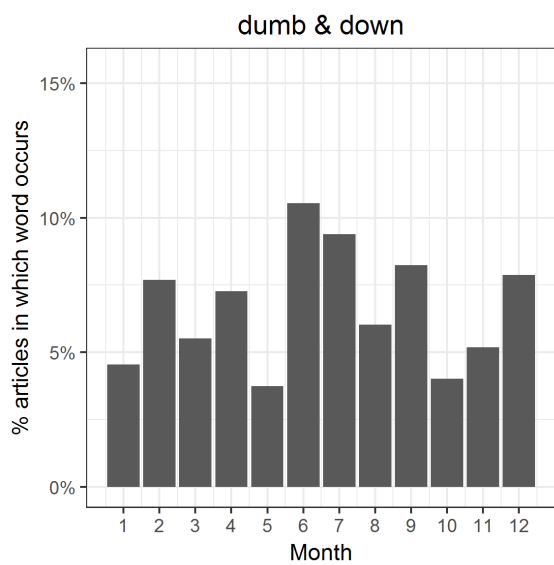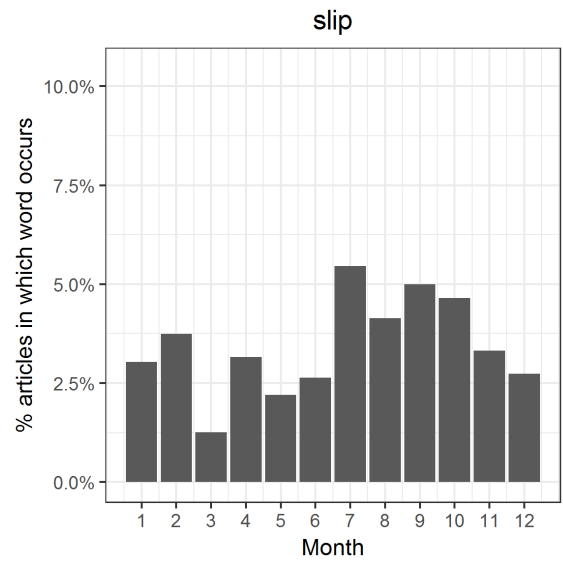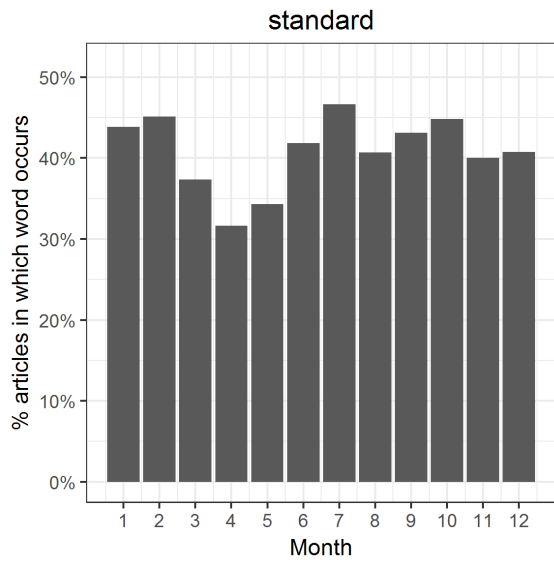
Figure A10: Occurrence of words and phrases relating to standards over months

Note: Each bar represents the proportion of articles in which the phrase occurred in that month, aggregated over all years.

board

## ocr, meg, rsa, aqa, aeb, jmb, neab, nea, seg, pearson, edexcel, lreb, uleac, wjec, eduqas

ofqual, qca, scaa, regulator, watchdog
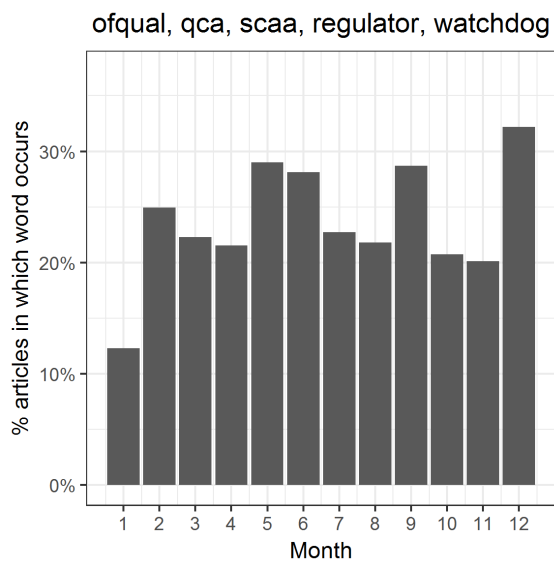
Figure A11: Occurrence of words and phrases relating to exam administration over months

Note: Each bar represents the proportion of articles in which the phrase occurred in that month, aggregated over all years.

**error, mistake**

appeal

resit, retake

grade & boundary
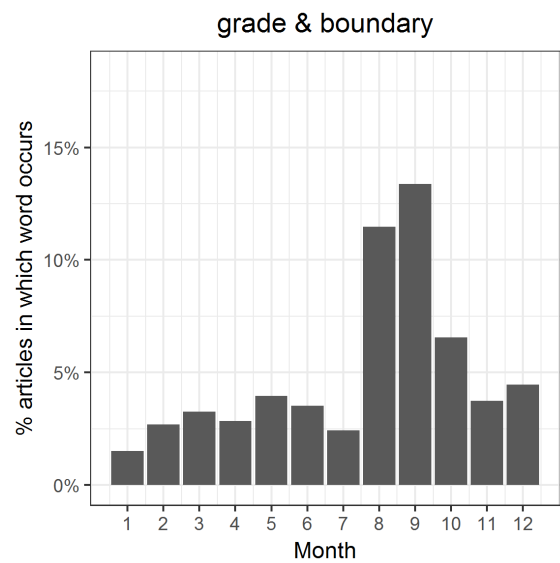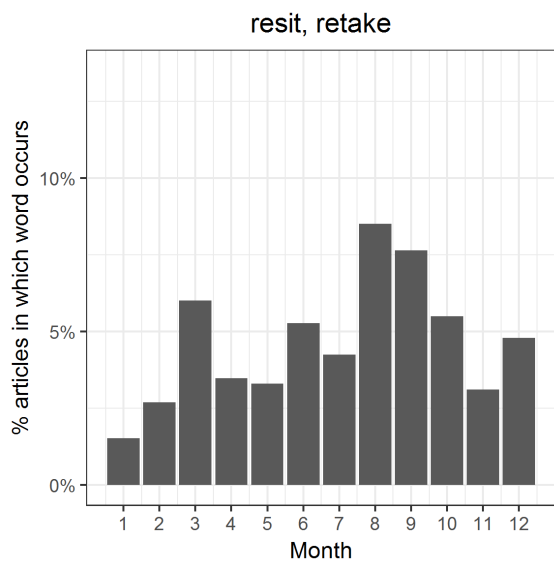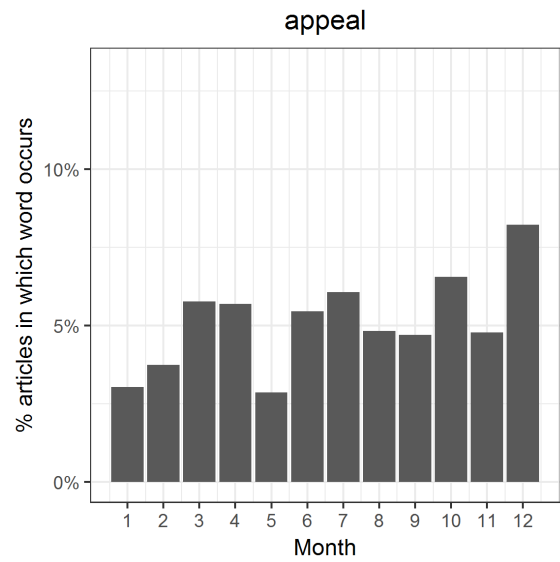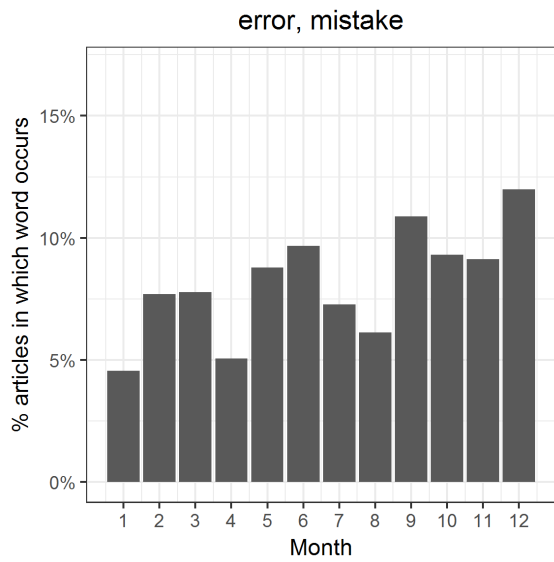
Figure A12: Occurrence of words and phrases relating to coverage of exam board activity over months

Note: each bar represents the proportion of articles in which the phrase occurred in that month, aggregated over all years.
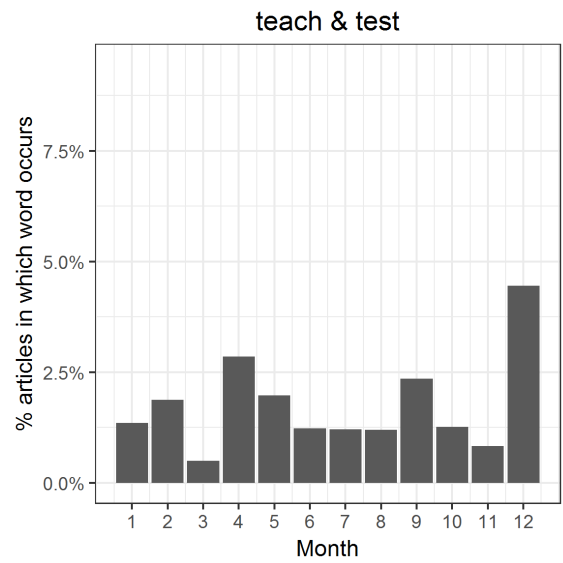
stress

health

mental & health
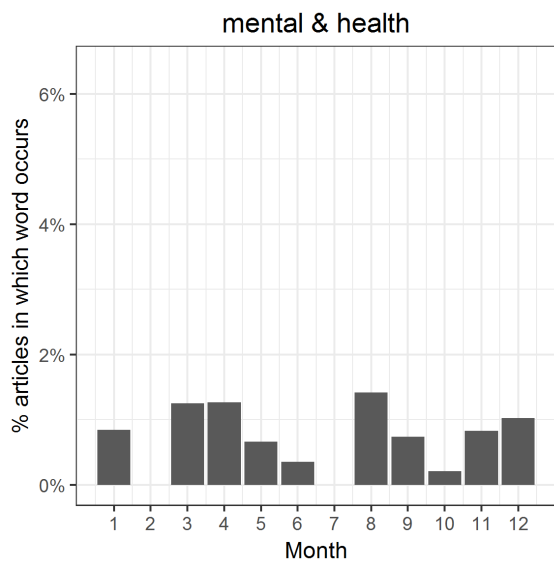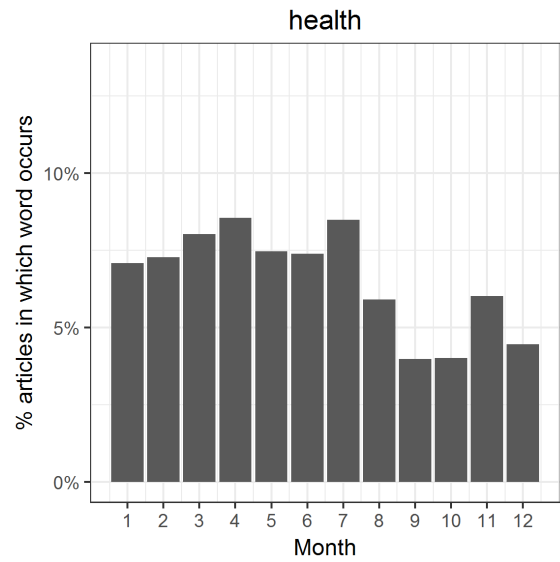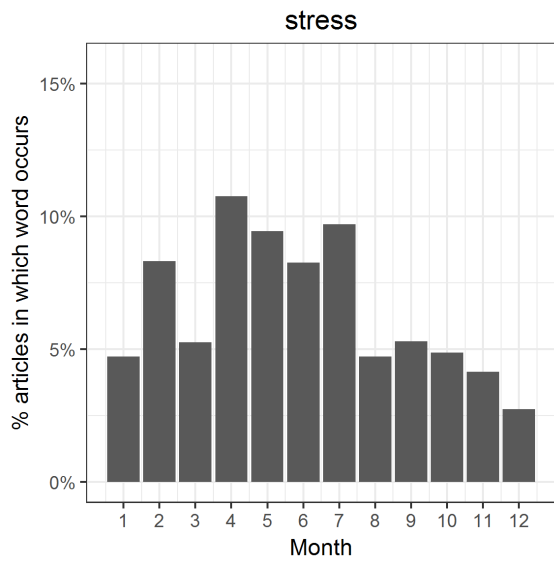
Figure A13: Occurrence of words and phrases relating to coverage of impacts on students over months

Note: Each bar represents the proportion of articles in which the phrase occurred in that month, aggregated over all years.
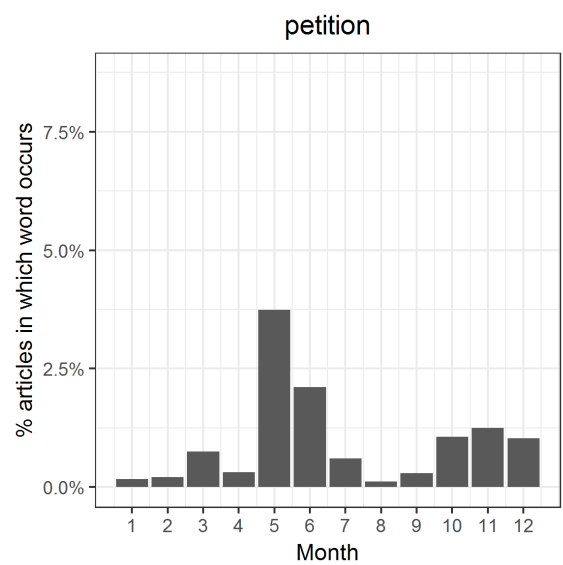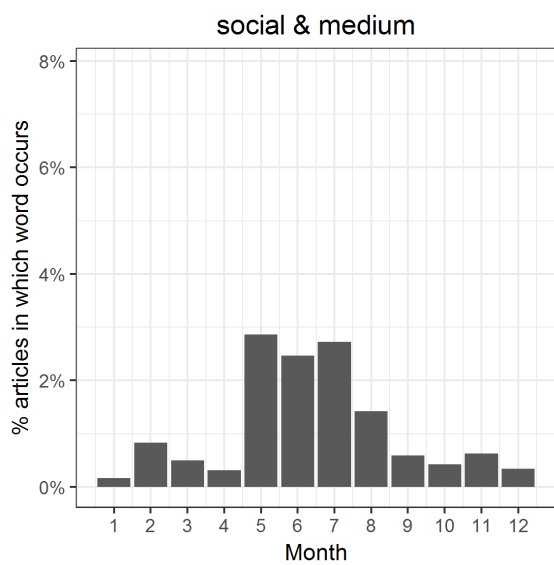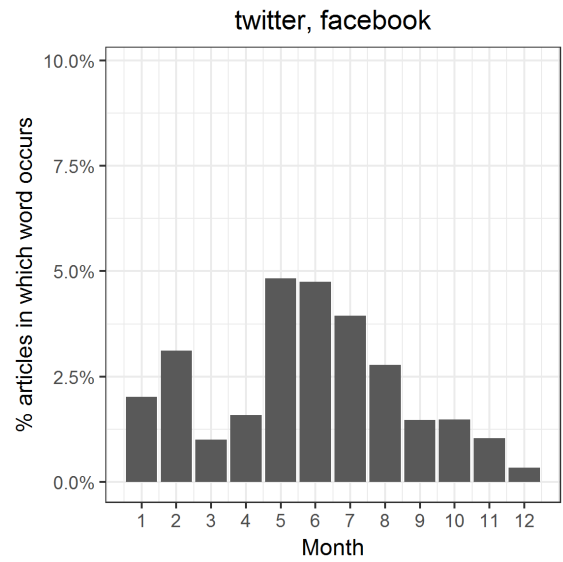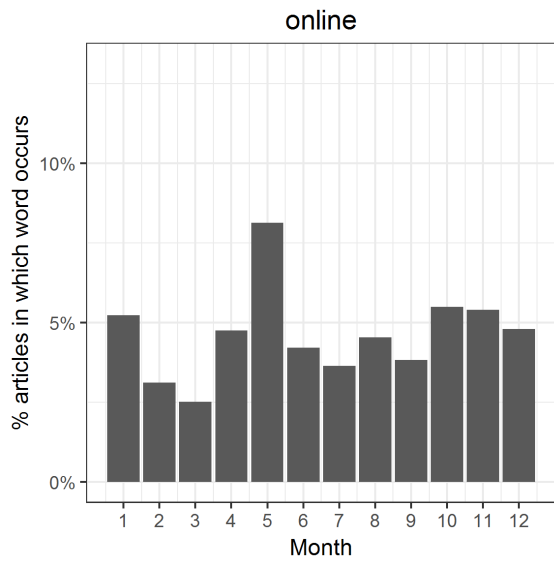
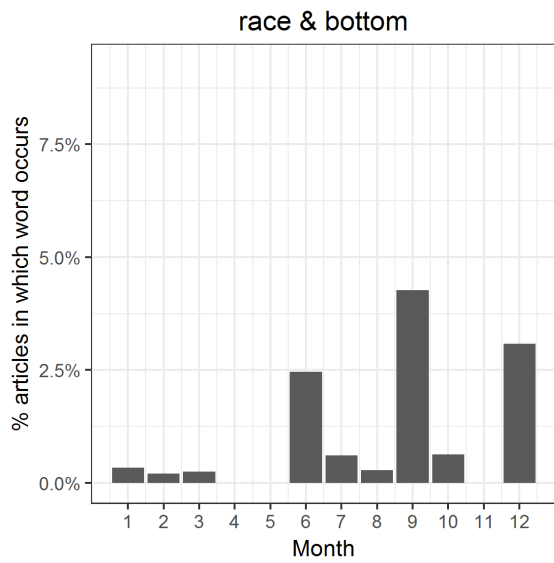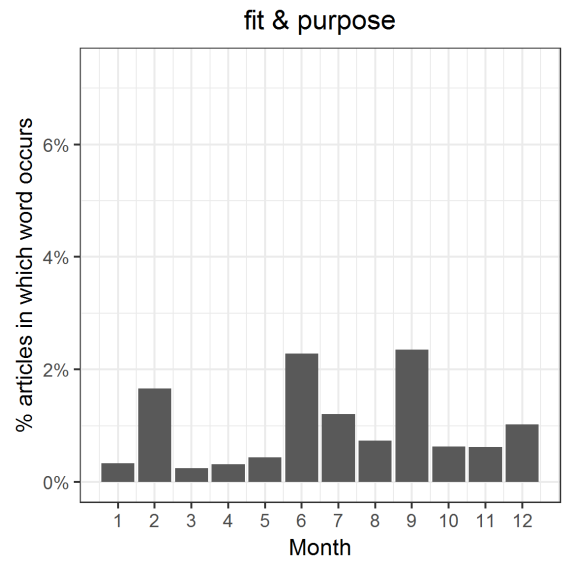*Figure A14: Occurrence of words and phrases relating to the internet and social media over months*

Note: Each bar represents the proportion of articles in which the phrase occurred in that month, aggregated over all years.

english

maths, mathematics
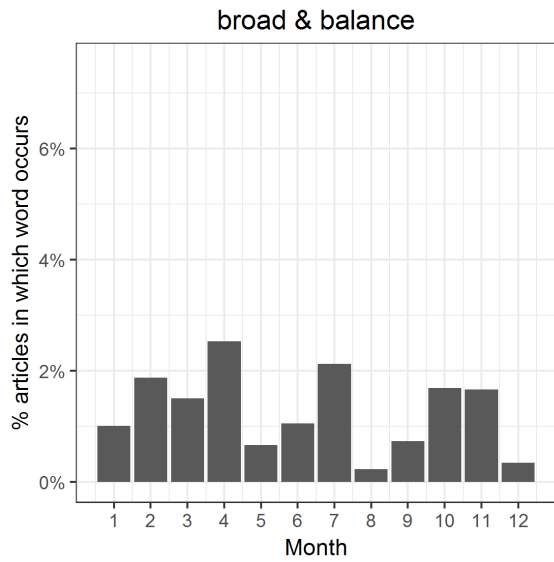
science, biology, chemistry, physic
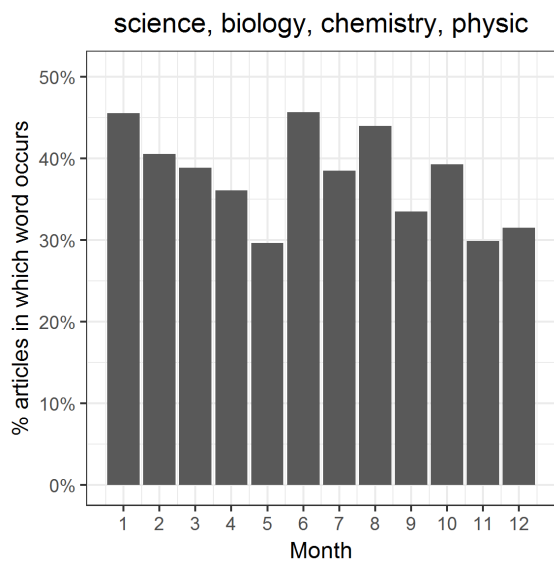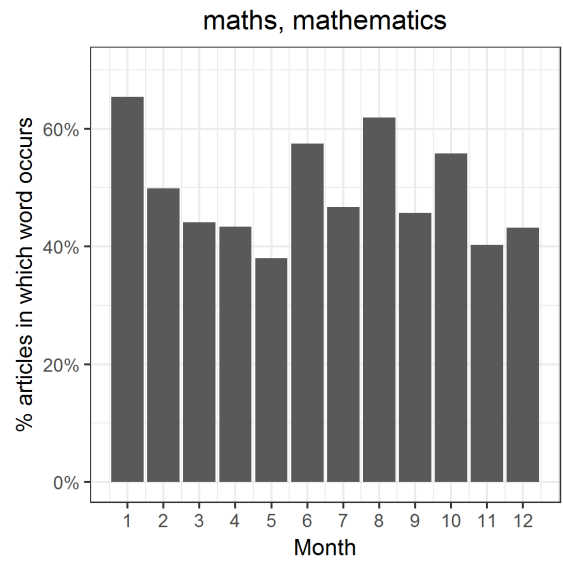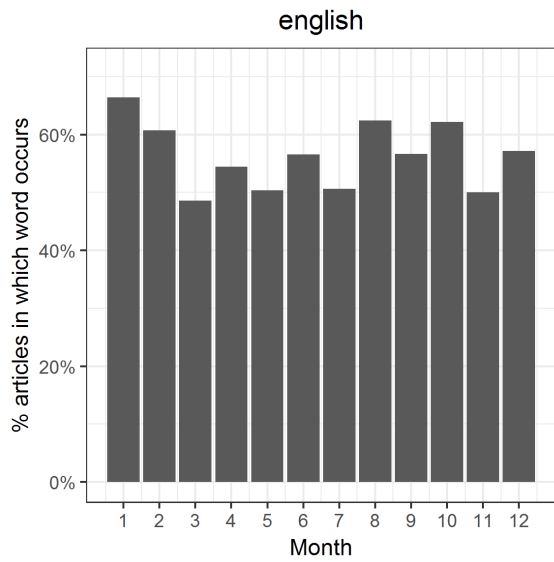
Figure A15: Occurrence of words and phrases relating to core subjects over months

Note: Each bar represents the proportion of articles in which the phrase occurred in that month, aggregated over all years.
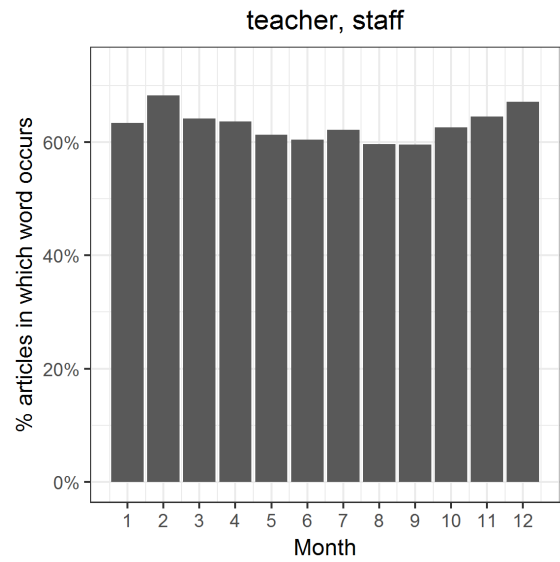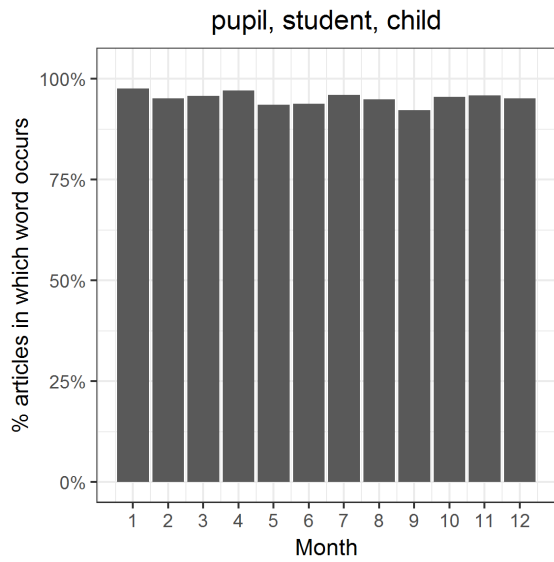
Figure A16: Occurrence of words and phrases relating to students and teachers over months

Note: Each bar represents the proportion of articles in which the phrase occurred in that month, aggregated over all years.
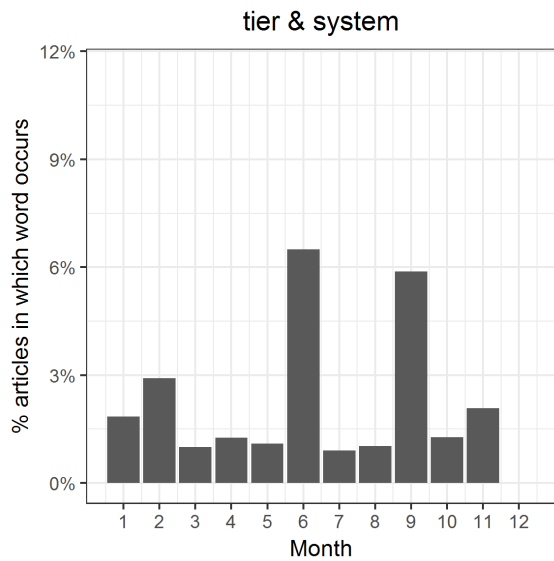
Figure A17: Occurrence of words and phrases relating to educational buzzwords over months

Note: Each bar represents the proportion of articles in which the phrase occurred in that month, aggregated over all years.