Text-organizing metadiscourse: tracking changes in rhetorical persuasion
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Abstract:	Interest in pragmatic aspects of historical texts have now extended to look at diachronic change, but studies tracing how academic texts have responded to recent developments in publishing practices are rare. In this paper we look at the pragmatic concept of interaction and how the writer's understanding of readers as expressed through metadiscourse may have changed over the past 50 years. Focusing on the reader-focused, text-organising interactive features of metadiscourse, rather than on stance-taking elements, we explore how academic authors signal purposes, clarify concepts, support ideas and make connections to assist readers to better understand a text and recover the writer's intentions. Based on 2.2 million words from articles in the top journals in four disciplines we show how interactive metadiscourse has changed in recent years. The results show a considerable increase in an orientation to the reader over this period, reflecting changes in both research and publication practices.
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Text-organizing metadiscourse: tracking changes in rhetorical persuasion

While historical pragmatics is now a well-established field, interest in the diachronic change of pragmatic features, informed by language corpora, is a relatively new area of study (e.g. Taavitsainen, Jucker & Tuominen, 2014; Aijmer & Ruhlemann, 2014). Research which explores data that spans decades and asks questions that trace developments over time, however, has not yet turned its attention to published academic writing: a form of discourse which often seems to be fixed and invariable. Beneath this apparently frozen and impersonal textual surface, however, are features of interest to those who study pragmatics. Here are traces of interactions between writers and readers which change in response to contextual circumstances in the same ways as language used in any other register. In this paper we explore one aspect of these interactions and how it has changed in the past 50 years. Focusing on what has been called interactive metadiscourse (Hyland, 2005; Hyland & Tse, 2004), or the ways authors organise their material for particular readers, we analyze a corpus of 2.2 million words compiled from articles in the top journals in four disciplines to discover whether, and to what extent, interactive metadiscourse has changed in different disciplines since 1965.

Interactive metadiscourse: cohesion and interaction

Metadiscourse is the commentary on a text made by its producer in the course of speaking or writing. Although it is understood in various ways, there is broad agreement that texts demonstrate both the writer's stance on something and an awareness of readers. Any successful text, whether written or spoken, is therefore one that takes into account readers' likely objections, background knowledge, rhetorical expectations and processing needs. Hyland's (2005) widely used model of metadiscourse distinguishes *interactive* from *interactional* resources (terms borrowed from Thompson, 2001). Interactive features are concerned with ways of organising discourse to help readers recover the writer's intentions and interactional features signal more explicitly the presence of the writer and his or her attitudes, commitments and assessments of material.

While both aspects of metadiscourse are important for modelling interpersonal aspects of texts, the resources used to organise a discourse, rather than the writer's stance towards it, have received relatively less attention. Thus the focus has largely been on how writers seek to achieve their goals by hedging

or boosting claims, expressing attitudes and projecting a personal involvement (e.g. Abdi, 2002; Gillaerts & Ven de Velde, 2010; Estaji & Vafaeimehr, 2015; Mur Duenas, 2007). But *interactive resources* are no less important as they help to guide readers through a text by both creating surface cohesion and influencing their understandings of propositional material.

The cohesive, if not the interpersonal, aspects of this element of rhetorical persuasion has been recognized in some models of metadiscourse which restrict the term to what the author has to say about the organisation of the unfolding text (e.g. Mauranen, 1993; Ädel & Mauranen, 2010). Describing this as *text reflexivity* (Mauranen, 1993), only those elements of discourse which refer to the text itself, signalling its direction, purpose and internal structure, are included. While such an approach offers considerable insights about writing, it ignores important interpersonal meanings of these features. As Hyland has recently observed:

> Put simply, the use of discourse to manage social relationships is as important as, and probably inseparable from, its role in managing the organisation of texts. A text communicates effectively only when the writer has correctly assessed both the reader's resources for interpreting it and his or her likely response to it and we cannot fully comprehend this process by arbitrarily excluding a whole area of relevant rhetorical activity.   (Hyland, 2017: 20).

It is, then, unclear how metadiscourse can be restricted to text organising elements in any principled way (Hyland, 2017) as interactive and interactional elements are two sides of the same coin.

Interactive features link material, offer elaborations, signal text stages and refer to information elsewhere in the text are not merely the glue that holds a text together. They are both cohesive and pragmatic because they represent an internal dialogue with the reader, reflecting the writer' assessment of what needs to be done to present information in the most comprehensible and convincing way for particular readers. In Hyland's model (2005: 50-52) these interactive features (with examples from our 1965 corpus) comprise:

♦ *Transitions* comprise an array of devices, mainly conjunctions, used to mark additive, contrastive, and consequential connections between clauses, as opposed to events in the external world.

(1) <u>By contrast</u>, the weight of the hair was raised in the cold by from 9 to 29%. <u>Accordingly</u>, the total insulation conferred by skin plus hair was slightly higher in the cold than at 21℃. <u>Moreover</u>, if the hair was ruffled, there was an improvement in insulation, in skins from cold-adapted A2 G and C 57 BL, of about 25 per cent.   (Biology)

♦ *Frame markers* are references to rhetorical elements of text structure, used to sequence, label text stages, to announce discourse goals and to indicate topic shifts.

(2) <u>In the next section</u> we elaborate these objections further.   (Sociology)

♦ *Endophoric markers* make additional material salient and available to the reader in recovering the writer's intentions by referring to tables, diagrams or other parts of the text.

(3) <u>As noted above</u>, a small dc offset may be applied here for balancing purposes.

(Electronic engineering)

♦ *Evidentials* indicate textual information which originates from outside the current text, mainly consisting of citations (*Smith argues that*) and explicit evidential markers (*according to*).

(4) <u>According to Florey (1961)</u>, evidence of cholinesterase activity does not necessarily imply that acetylcholine is the transmitter.   (Biology)

♦ *Code glosses* restate, reword or illustrate ideational information for greater clarity.

(5) <u>In other words</u>, practical difficulties are one thing and theoretical limitations are quite another.

(Applied linguistics)

As we can see, these interactive resources enable the writer to manage the information flow and to explicitly establish his or her preferred interpretations. They represent the writer's knowledge of the context and what readers are likely to find most familiar, plausible and persuasive. Interactive metadiscourse, therefore, is based on the writer's knowledge and familiarity with the conventions and expectations of a particular community. So while these features play a cohesive role in weaving elements of the text together, they do so in ways that allow the reader to see connections in a way determined by the writer. Thus, the writer may decide that in order to understand the upcoming text more easily,

readers need to have a path laid out through it for them (6) or that a concept needs to be glossed to either familiarize readers with the argument (7) or to ensure readers understand it in the same way as the writer (8):

(6) Three theoretical implications of proposition 1 can be tested. <u>First</u>, the proposition asserts a causal link ... <u>Second</u>, it implies that cue level will be a direct, measurable function ... <u>Third</u>, it suggests that status characteristics will affect task cues.   (EE, 1985)

(7) they are faced with an essentially similar task, <u>namely</u>, that of inducing a grammar on the basis of data which are impoverished in various ways.   (AL, 1985)

(8) Literal translations are cases in which the informant has translated each part of a multi-word item, so Gerinan Teufelskreis (<u>= vicious circle</u>) was translated by one informant literally as devil-circle.   (AL, 1985)

So while interactive features refer to the text itself, and often contribute to its cohesion, they also represent authorial interventions to better ensure the comprehension of the message and readers' compliance with the direction and argument.

We can also see the rhetorical importance of such interventions when we consider choices within particular categories of interactive metadiscourse. Deciding to link ideas using a comparison marker (9) rather than, say, an additive one (10), for example, sends a clear signal of how the author intends the link to be understood, the first as similar to what has preceded it and the second as additional supporting material:

(9) Prior work <u>likewise</u> suggests that employers' latitude in decision making enables subtle biases in performance evaluation.   (Soc, 2015)

(10) Consistency and forbearance, <u>moreover</u>, greatly vary across individuals. (Soc, 2015)

Interactive metadiscourse choices can also emphasize aspects of the presentation in addition to how connections should be understood. Thus while both *since* and *because* are used to alert readers to the fact that a conclusion is being drawn or justified, the former helps focus on the result of an action or decision, whether it introduces a main or subordinate clause (11, 12), and the latter emphasizes the reason for it (13, 14):

(11) <u>Since</u> it has proved difficult to assess soil fertility for forest growth, foliar analysis has been adopted as an alternative method.   (Bio, 1965)

(12) Ultrastructural studies were performed on four groups of 4-week-old mice, <u>since</u> young mice display higher levels of structural plasticity than adult mice. (Bio, 2015)

(13)<u>Because</u> the time for the plant equipment to respond may require several seconds it is desirable to use the "dead" time to initiate other functions or programs. (EE, 1965)

(14) A fuzzy model in the form of Takagi-Sugeno (T-S) is used <u>because</u> it has the properties of a universal approximator.   (EE, 2015)

So while these decisions play an important part in creating cohesive discourse, they simultaneously organize and present propositional information in ways that a target audience is likely to anticipate and will find coherent and convincing.

This orientation to the reader is crucial in English research writing as writers have to anticipate and respond to the potential negation of their arguments. Academics therefore make these metadiscourse choices based on an assessment of their readers' knowledge and expectations, what they are likely to have trouble processing and what they may disagree with. This also reveals something of how the writer understands the community being addressed (Hyland, 2005; Hyland & Tse, 2004). Metadiscourse thus suggests a familiarity with an audience and so connects texts with their contexts and, as a result, it has been used to explore patterns of interaction in different genres and disciplines as well as other languages.

Most metadiscourse research has focused on academic writing in English, with attention mainly devoted to research articles (e.g. Mur Dueñas, 2011; Salas, 2015), and often their introductions (e.g. Rubio, 2011) or abstracts (e.g. Gillaerts & Ven de Velde, 2010). Cross-disciplinary metadiscourse studies are an extremely productive area of research and disciplinary variations have been found in research articles (e.g. Jiang & Hyland, 2016; Cao & Hu, 2014), undergraduate essays (Noble, 2010), post graduate dissertations (Charles, 2006), academic book reviews (Tse & Hyland, 2006), and uni-

versity textbooks (Hyland, 1999). Such studies reveal considerable variations in the means of academic persuasion and have helped illuminate the rhetorical and social distinctiveness of disciplinary communities.

Despite this interest in metadiscourse, however, the study of interactive features remains underexplored and we know almost nothing of how these features have changed over time; whether they have increased or declined; whether some fields have seen greater changes than others; or whether some features have become more frequent in academic arguments. This study addresses this gap, focusing on high Impact Factor journals in contrasting disciplines.

Corpus and method

To track any changes in interactive metadiscourse uses over the past 50 years, we created three corpora taking research articles from the same five journals in four disciplines spaced at three periods over the period: 1965, 1985 and 2015. The fact that journals come and go, that they undergo topic fragmentation and specialisation, and that they are replaced by new ones over 50 years places some constraints on diachronic research, but we sought to select robust journals at the top of their respective fields with a long history. Applied linguistics, sociology, electrical engineering and biology were selected as representative of both the soft fields and the hard sciences (Becher & Trowler, 2001), and we took six papers at random from each of the five journals which had achieved the top ranking in their category according to the 5-year impact factor in 2015[1]. The journals are listed in Appendix 1. Two journals, *TESOL Quarterly* and *Foreign Language Annals*, only began in 1967 and so papers were chosen from issues in that year.

Overall, the corpus comprises 30 articles from each discipline from each year so that the corpus comprised 360 papers of 2.2 million words. The details of the corpus are shown in Table 1, indicating a massive increase in the length of articles over this period:

Table 1: Corpus characteristics by total words and mean length per article

Discipline	1965	1985	2015	Overall
Applied linguistics	110,832 (3694.4)	144,859 (4828.6)	237,452 (7915.1)	493,143 (16438.1)
Biology	244,706 (8156.9)	263,465 (8782.2)	237,998 (7933.3)	746,169 (24872.3)
Electronic engineering	92,062 (3068.7)	97,545 (3251.5)	235,681 (7856.0)	425,288 (14176.3)
Sociology	149,788 (4992.9)	196,232 (6541.1)	262,203 (8740.1)	608,223 (20274.1)
Totals	597,388 (19912.9)	702,101 (23403.4)	973,334 (32444.5)	2,272,823 (75760.8)

Using *AntConc* (Anthony, 2014), a freeware concordance and analysis tool, we searched each of the 12 sub-corpora for the items in Hyland's (2005) list of most common realisations of interactive meta-discourse across a range of registers. We should point out here that metadiscourse is an open category and writers are able to add new items according to their needs in expressing particular functions. There seems, however, to be preferred patterns of realisation in particular communities which have become established over time as a result of social practices and epistemological beliefs. We should also note that because these preferred expressions change over time, the items we have searched for may fail to account for items that were in popular use in 1965 but which had completely died out by the time Hyland's list was compiled in 2005. In other words, the functions that interest us could have been conveyed by other means in the earlier period.

This is, however, an unavoidable limitation of diachronic corpus studies (cf. Leech, 2009; Moskowich, Camiña Rioboo, Lareo & Crespo, 2016). Pragmatics has traditionally relied on qualitative analyses of language and it is, of course, possible to study the expression of one or two functions, focusing more closely on a small collection of texts and manually coding each instance through close reading of those texts. This is a "thick" approach and while it has advantages in being more sensitive to contexts, it fails to aggregate features expressing particular forms across a large number of users and so does not pick up wider rhetorical changes in response to new situations. This trade-off between large generalizations and rich contextualizations has been referred to as a 'double bind of historical corpora' (Jucker

& Taavitsainen, 2014: 13). Our study, however, is undertaken in the spirit of diachronic corpus pragmatics seeking to establish patterns of linguistic change (e.g. Bergs & Brinton, 2012; Taavitsainen, Jucker & Tuominen, 2014) rather than simply how things were at particular historical points.

Studying change means it is necessary to select a set of forms which can be compared across time. Our method allows us to do this, showing both how items have declined and increased in a large number of texts from the three periods measured. Given that we are dealing with a relatively short span in the evolution of a genre which traditionally exhibits glacially slow variation, and that we have are exploring a relatively large number of items, around 200 features, we are also confident that the markers we have identified in the later period do not exclude any that were common in the earlier one. While features may have declined or grown in popularity, it is unlikely that any will have disappeared altogether. So, while not exhaustive, the items in Hyland's list (Hyland, 2005: 218-220) provide a useful starting point for examining diachronic and disciplinary variations.

An important departure from Hyland's list adopted in this study was to omit both *and* and *or* from the counts. These are included in the category of *transitions* but represent the default options for marking conjunctive relations of addition and alternation rather than conscious rhetorical strategies for signalling particular writer intensions. They therefore seem to carry reduced pragmatic meanings and produce thousands of examples in academic texts. Biber et al (1999: 79), for example, note that a*nd* and *or* are far more frequent in academic prose than in conversation, while *but*, a common marker of contrast in conversation, is least frequent in academic prose (1999, p. 81). Therefore we retained *but* as it is available for authors in free opposition to other contrast markers such as *although*, *however*, *nevertheless* and *on the other hand*. Our manual scan of a 10% sample of these three items agreed with Biber et al's observations so we omitted *and* and *or* but not *but*.

To ensure that items were functioning as metadiscourse, every concordance line containing an occurrence of these items were manually checked. Both authors worked independently and achieved an inter-rater agreement of 95% before resolving disagreements and excluding extraneous items. Examples of ambiguous cases which we believe are functioning to convey propositional information rather than

help organise the text are shown here:

(15) Garlic is not the <u>first</u> plant species to display these properties.   (Bio, 1985)

(16) From <u>then</u> on the plant accumulates storage proteins and carbohydrates. (Bio, 1965)

(17) …the sole <u>purpose</u> of the Q, parameter is to enable the derivation of the queue state probabilities   (EE, 2015).

(18) In the case of non-sprouting species, such as C. megacarpus, shoot dieback would probably <u>result</u> in whole-plant death   (Bio, 2015).

In other words, metadiscourse analysis is not simply a quantitative method of hunting down and counting items on a pre-defined list. It is a qualitative and interpretative approach to discourse analysis which involves identifying *forms* acting in the service of *rhetorical objectives*. It is also important to note that metadiscourse is often realised by signals which can stretch to clause or sentence length so that frequency counts do not convey the overall amount of metadiscourse in a corpus, but simply compare different patterns of *occurrence* of metadiscourse in corpora of unequal sizes. Frequencies are therefore a way of measuring change rather than the absolute extent of metadiscourse use. Having checked all instances to ensure they were performing metadiscoursal functions, we then normalised the results to 10,000 words to allow comparison across corpora of different sizes. Log Likelihood tests were then used to determine differences of statistical significance.

Overall changes in interactive metadiscourse

We found almost 37,000 cases of interactive metadiscourse in the 2015 corpus or 379 cases per 10,000 words of text, representing an increase of 120% since 1965. Figure 1 shows that cases have more than kept pace with inflated word counts, growing by 35.3% over the period when taking the large increase in the length of papers into account (*Log Likelihood* = 1092.70, *p* < 0.001).

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Figure 1: Overall distribution of interactive metadiscourse 1965-2015
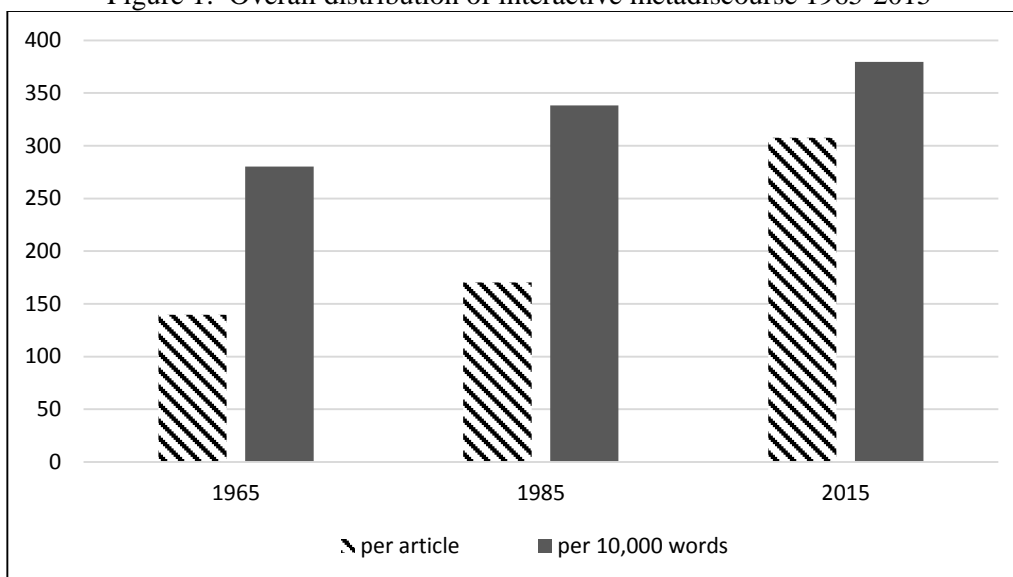
This is, of course, a substantial increase in the role of interactive features in academic persuasion over the last 50 years. Figure 2 shows that transitions (e.g. *because, therefore, next*) and evidentials (*according to, reference*) remain the most frequent forms by some distance and that items in four categories increased per 10,000 words ($p < 0.001$) with the only exception, transition markers, declining slightly by less than 1%. Frame markers (*to conclude, In the next section*), which signal text structure and argument shifts, increased by 15% per 10,000 words, while endophoric markers (*see table, as stated above*), pointing readers to information elsewhere in the text, were up by over a third. Evidentials (up 97%) and code glosses (59 %) (*for example, in other words*) recorded the highest increases over the period (*log Likelihood* = 1545.6, $p < 0.001$; *log Likelihood* = 275.9, $p < 0.001$ respectively).

As can be seen, only the evidentials curve is dramatic, reflecting the massive expansion of citation in academic persuasion in the last 50 years. Citation is a key way in which claims are integrated into current knowledge, either by situating the new work into a structure of already accredited facts, or by challenging those facts to carve out a novel position. Overall we found nearly double the frequency of evidentials (per 10,000 words) in 2015 compared with 1965, with citation consistently accounting for nearly all cases, as both research needing to be referenced has increased dramatically along with the ease of accessing it with the emergence of the internet and electronic publishing. It is also likely,

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however, that these figures represent changing patterns of argumentation in these fields, perhaps influenced by changing norms due to the greater participation of EAL (English as an additional Language) authors in international journals (Hyland & Jiang, 2017b).

Figure 2 Frequencies of interactive metadiscourse markers over time (per 10,000 words)
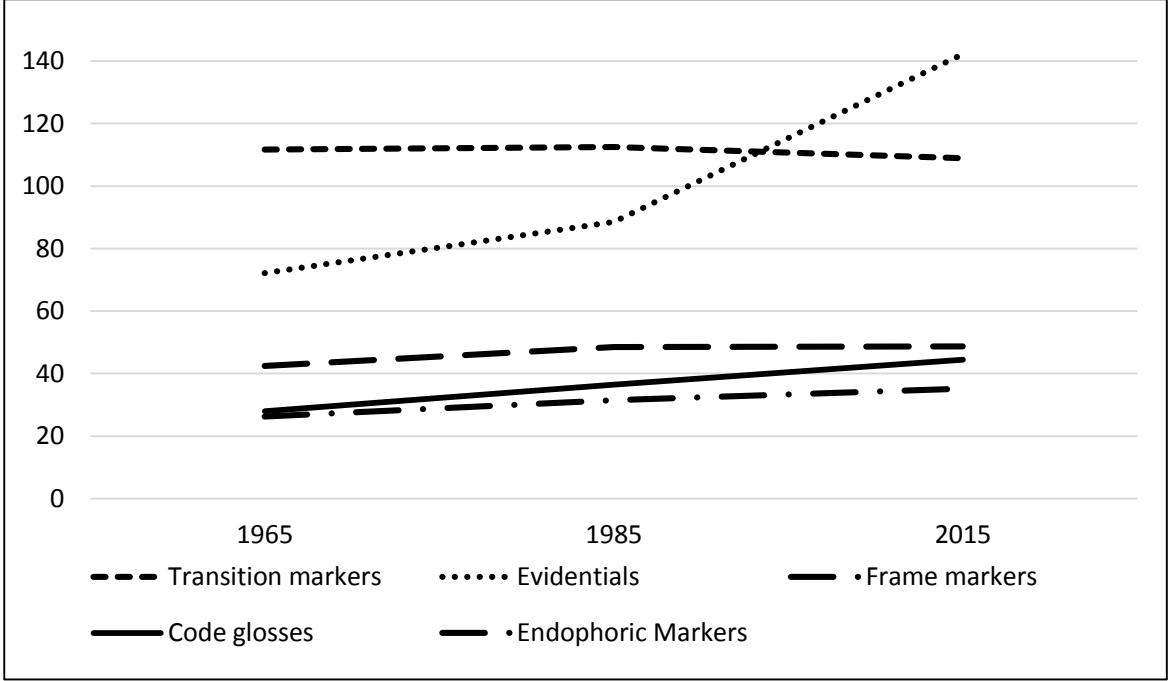
The growth in the use of interactive features more generally has been uniform across the four disciplines we studied, with particularly high increases in applied linguistics, where they have risen by 70%, and engineering by 35%. Figure 3 shows these upward curves with the most significant changes appearing to occur in the past 30 years. Both electronic engineering and biology are fairly constant in their use of these interactive metadiscourse features until 1985 and then there is an accelerated rise. It is during this more recent time that both the importance of getting work published (and noticed), and the competition to do so in an increasingly crowded market, has grown most significantly. The ability to persuade an increasingly diverse audience of one's arguments, has created a rhetorical context in which interactive features are ever more important in contributing to clarity and guiding readers to preferred interpretations. This can be seen not only in changes in interactive features but in what journals expect authors to do. For example, *The Quarterly Review of Biology* suggests manuscripts should "be intelligible both to general biologists and to specialists in other fields" [2].

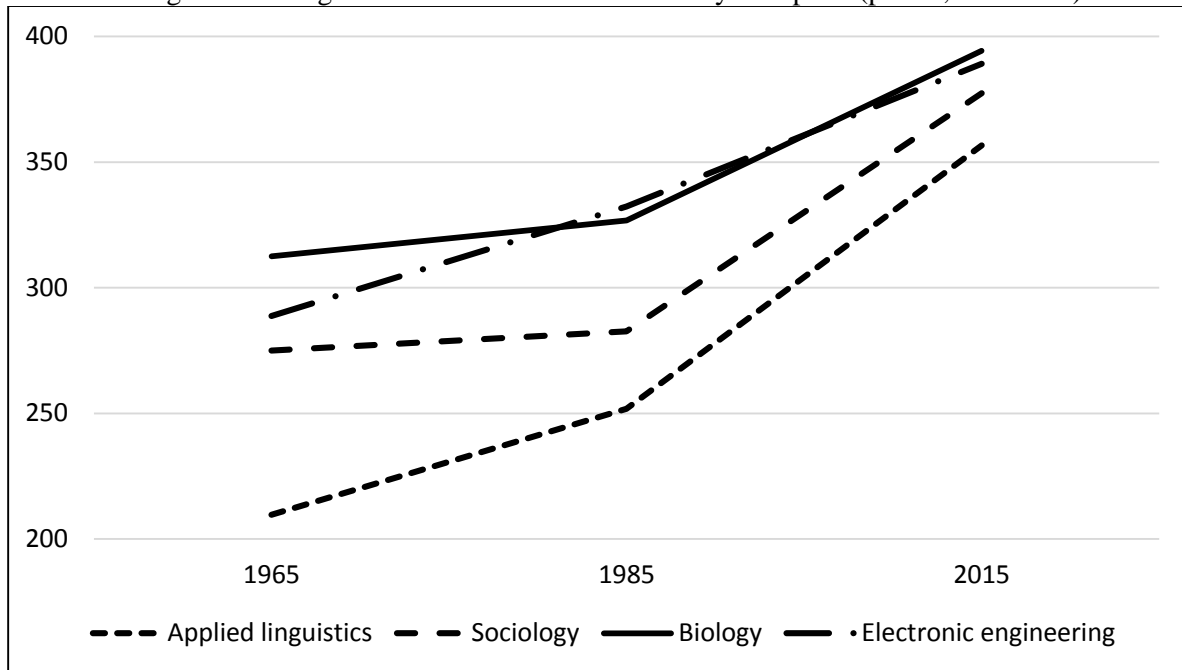Figure 3. Changes in interactive metadiscourse by discipline (per 10,000 words)

Table 2 offers a more detailed picture of these changes, identifying the trends for each interactive metadiscourse category by discipline. The steady increases in these features displayed in our data point to their rhetorical importance in academic persuasion, underlining the fact that they are not merely text organising devices but function to mark writers' assessments of readers' expectations and knowledge. Because these features shape a text to better ensure a reader's understanding and agreement, they reflect different disciplinary epistemologies and argument patterns. These overall increases are therefore marked by disciplinary variations in frequency and use. So, although transitions and evidentials are by far the most frequent devices in all four disciplines and endophorics and code glosses have increased across the board, we can see from the table that not all features show consistent trends. Frame markers have increased in the hard sciences, for instance, and fallen in the social sciences and transitions have fallen in all fields except applied linguistics. We will consider these trends in more detail in the following sections.

Table 2: Changes in categories of interactive metadiscourse by discipline (per 10,000 words)

Features	Applied linguistics			Sociology			Biology			Engineering		
	1965	1985	2015	1965	1985	2015	1965	1985	2015	1965	1985	2015
Evidentials	9.0	42.5	131.1	61.5	76.6	155.8	121.4	134.3	173.3	33.8	53.6	106.8
Transitions	103.0	108.9	112.7	122.0	118.5	118.6	116.8	112.9	113.7	92.1	91.1	89.2
Frame markers	41.6	41.0	37.6	49.2	43.4	42.0	27.1	27.5	33.2	73.3	84.1	83.1
Endophorics	16.5	17.9	23.5	11.3	13.0	18.1	28.2	29.4	32.0	57.0	63.4	69.1
Code glosses	39.5	41.5	51.7	31.0	31.1	42.9	19.0	22.7	42.1	32.5	40.1	40.9
Totals	**209.6**	**251.8**	**356.6**	**275.0**	**282.6**	**377.4**	**312.5**	**326.8**	**394.3**	**288.7**	**332.3**	**389.1**

Transitions: Expressing textual relationships

Transition markers are conjunctions and adverbial phrases which signal additive, causative, contrastive and other logical relations in the writer's thinking and so help readers interpret connections between steps in an argument. They are more frequent in academic prose than in conversation and other registers as a result of the need to mark the connections between ideas and the flow of argument (Biber er al, 1999: 562). As we have noted, however, these devices also signal how the writer wants these connections to be understood: they help to rhetorically construct coherence as well as cohesion. With '*and*' and '*or*' eliminated from the counts due to their routine automaticity as default connectors, *also* is now the most frequent device in this category overall (24.4 cases per 10,000 words), having recently replaced *but* (21.6 cases). With much lower frequencies, *however, since* and *because* have consistently filled the next positions over this period.

Interestingly, there has been an increase in the proportion of metadiscourse features marking addition (*in addition, moreover, furthermore, also, further*) at the expense of contrast and concession. *Also* is by far the most common marker of addition, often called upon not simply to combine ideas of equal importance, but to mark and give greater emphasis to the information which is being added:

(19) The protein pattern shown in Figure 7 <u>also</u> demonstrates that alliinase is the most predominant protein in garlic leaves and is far more abundant than lectin. (Bio, 1985)

(20) Officers know by sight many individuals whom they suspect or know to be criminals who operate in their districts. Officers <u>also</u> carry stereotypes of what criminals look like.   (Soc, 1985)

The fact that it often occurs together with the conjunction *and* suggests it is doing more than merely adding extra material. We can see from these examples that the writer is conveying an attitude towards the second piece of information, signalling its potential truth or importance:

(21) Instead, the effect of contraction is handled primarily through employment exits <u>and</u> possibly <u>also</u> through adjustments of hiring rates.   (Soc, 2015)

(22) We inquired about the number of ESL students each instructor had taught, <u>and</u> we <u>also</u> inquired about instructors' knowledge of languages other than English. (AL, 1985)

Like *also*, *but* seems to be a coordinator which is linked more closely to the element it introduces rather than connecting equal elements. We can see here that it is used not only to mark contrast with the preceding idea, but to highlight the significance of the second:

(23) However, as Promislow (2003) pointed out, in humans, many women experience increased risks of mortality during childbirth <u>but</u> live longer than men, even in developed countries.   (Soc, 2015)

(24) According to research by Audrey Kurth Cronin (2003), PKK members who engaged in suicide bombing did not volunteer, <u>but</u> rather were forcibly coerced to use this tactic.   (Soc, 2015)

The popularity of *but* is also at least partly a result of its positional flexibility. So while *however* is 6 times more common as a sentence initial contrastive marker, for example, initial *but* carries considerable impact due to its informal connotations (Hyland & Jiang, 2017a).

(25) <u>But</u>, to rigorously analyze coax-fed patches, we need to consider a three-dimensional (3-D) planar metallic object.   (EE, 2015)

(26) <u>But</u> while this may reveal singular/general as needed for disambiguation, (3) still shows that it does not suffice.   (AL, 2015)

Most significantly, transitions are increasingly used in academic discourse to explicitly mark consequential relations, clearly signalling the implications of a finding or statement for the reader. This ensures that the reader takes away the same interpretation as the writer intended:

> (27) It is possible, <u>therefore</u>, that trimerization of the SIE element, as in the (SIE)3-TK CAT construct, somehow compensates for the artificial structure of this synthetic promoter.   (EE, 2015)

> (28) <u>Hence</u> legal norms and legal procedure might be seen to provide a less predictable and hence less trust-enhancing context for business relations.(Soc, 2015)

However, although these uses indicate a rhetoric which is geared towards regulating reader interpretation and overt persuasion, Table 2 shows that the frequencies of transition markers have declined as an overall *proportion* of interactive metadiscourse items over this period. In fact they have fallen from 40% of all interactive markers in 1965 to 28% in 2015. This is mainly a result of the fact that evidentials have risen to make up 38% of devices, but it is interesting that transitions have declined per 10,000 words in three of the four fields studied. This may be because writers are now relying to a greater extent on readers recovering lines of argument by less explicit means. This may involve using specialist noun phrases, drawing on inferential connections, and expecting readers to recognise connections through familiar macro patterns in the text, such as Introduction Methods Results and Discussion (e.g. see Hoey, 1983). The growing numbers of EAL authors over the period may be a factor here as it is possible they bring less reader-oriented rhetorical practices to this context.

The exception where transitions have fallen is applied linguistics, which is a discipline almost unrecognisable from its early papers in the 1965 corpus. From a field largely concerned with teaching practices, it has seen an increase in empirical studies, a broadening of the discipline to embrace a wider array of topics, and a massive growth of a literature which supports its academic endeavours. All these factors have contributed to massive changes in how arguments are constructed, with less narrative framing and more complex discussions and relationships between ideas which require, among other things, more transitions to elaborate arguments. Whatever the reason for these trends, and there may

be several, the data shows us that readers in three of our four fields now get slightly less explicit assistance with a text through the formal marking of logical relations. It remains to be seen whether this trend will continue.

Frame markers: structuring lines of argument

Frame markers, which are the forms used to label an up-coming segment of text, a shift in direction or the sequencing of material, have declined in the soft knowledge fields and increased in the hard sciences over the past 50 years. Electrical engineers are the heaviest users of these forms, perhaps because of the particularly large increase in the average length of their research papers, which have grown over 2.5 times in this period. Longer papers, of course, require more explicit structuring to ensure readers are able to follow the direction of the argument.

(29) The complexity of the issue requires a longer introduction than is usual, broken
into seven parts as follows…. (Soc, 2015)

(30) The following sections present the results of a literature review, descriptions of the
conventional measures and the DEA model, evaluation results of the selected programs based on the conventional measures and the DEA model, and the final conclusions. (EE, 2015)

Table 3 shows that sequencing devices showed the greatest increases, and while declining in the soft fields, they rose significantly in both electrical engineering and biology.

Table 3 Changes of frame markers by discipline (per 10,000 words)

Features	Applied linguistics			Sociology			Biology			Elec Engineering		
	1965	1985	2015	1965	1985	2015	1965	1985	2015	1965	1985	2015
sequencing	27.8	25.8	22.0	33.8	29.5	26.1	20.4	21.8	25.5	49.2	60.6	60.5
label acts	4.8	4.1	3.9	5.4	4.0	3.1	2.2	2.1	3.1	10.2	6.3	5.5
announce goals	4.6	6.8	7.1	4.3	6.0	9.2	1.2	1.2	2.4	3.3	6.6	8.9
shift topics	4.4	4.3	4.7	5.7	3.9	3.6	3.3	2.4	2.2	10.6	10.7	8.1

The forms used to express these functions have changed remarkably little over 50 years although writers today now use more explicit means of labelling text stages, drawing on speech acts (*to conclude*, *to summarize*, *to sum up*), thus conveying a more immediate impact in directing readers to what they should take from the discussion.

It is interesting to note that the forms showing the largest rises overall in the corpus are *first, second* and *finally* and their role in more explicitly structuring papers can be seen in these typical examples:

> (31) The analysis below had four parts. First, I briefly review critical readings of Thompson. Second, I reconstruct the role of language in Thompson's corpus. Third, I draw links between Thompson's cultural marxism and the theory of language developed by the Bakhtin Circle. Finally, I illustrate this perspective through an analysis of the language used by the silk weavers of London's Spitalfields district in the 1920s. (Soc, 2015)

> (32) This section has three sub-sections. First, the necessary notations are presented. Then the branching scheme is described. In the final sub-section the algorithm is provided. (EE, 2015)

Such overt marking of sequence obviously assists readers in processing longer texts and suggests writers believe that their readers may need such help. This may be because they assume greater numbers of non-specialists, or at least those less familiar with their methods or prior literature, may be included in the readership.

The corpus also shows that the only category of frame marker which increased across all disciplines was that used to more explicitly announce goals and purposes, ensuring that objectives can be effectively recovered by readers. These were expressed in a wide range of ways and applied both to the overall purpose of the paper (33-35) as well as to local, more immediate goals in parts of the discourse (36-38):

> (33) It is the aim of the present report to describe this system of pacemakers and conducting elements in detail (EE, 2015)

(34) And the principal <u>objective</u> of the analysis is to exhibit the contribution which the behavioral pattern makes to the preservation or the development of the individual or the group in which it occurs   (Soc, 2015)

(35) It is my present <u>intention</u> to review the evidence relative to this theory, and to suggest in contradistinction that the very same data may not be inconsistent with more classical notions of inherent sexuality at birth   (Soc, 2015).

(36) In this section <u>I will outline</u> the assumptions concerning the psychological processes that underlie the work in course construction that appears in Part II of the report.   (AL)

(37) Here I <u>want to</u> offer a number of hypotheses as to why some problems seem more baleful than others   (AL, 2015)

(38) We shall next <u>focus</u> our attention on time-varying fields because of their immense practical importance.   (EE, 2015)

Clearly, the expression of purpose can be a powerful tool in a writer's rhetorical repertoire, both marking the direction and hinting at the conclusion of the argument. It provides motivation for readers interested in the topic and a helpful aid to those who may be less familiar with the prior ideas.

A final function worth mentioning here is the role of interactive metadiscourse to label functional acts in the text. These rhetorical speech acts are likely to differ by register, but in academic writing they are most commonly used to summarise or draw conclusions from an argument at certain points in the text.

(39) <u>In short</u>, dictation activities seem to help students to become more conscious of the structure of the language…   (AL, 2015)

(40) <u>All in all</u>, there is little doubt that the conventional theory of the firm has come under varied attack and criticism, both by economists and others.
          (Soc, 1985)

(41) <u>Overall</u>, this reveals that a subset of the Nkx6.1+ ductal cells, the Notch-responsive CACs, can generate ductal and endocrine cells.   (Bio, 2015)

Explicitly pointing out how readers should interpret the preceding discourse is obviously a useful strategy to guarantee that they will get the take-home message of the argument. However, this practice has fallen about 20%, with a substantial drop in electrical engineering in particular. One reason for this may be the transparency of the function and possibly the degree of condescension it carries. Telling readers what you want them to think can be interpreted as an attitude of patronizing superiority and so act against your interests. If the argument is clear and pitched at an appropriate level for the audience, then writers may see less need for this function.

Code glosses and endophorics: elaborating concepts and arguments

Both endophoric markers and code glosses have increased across all disciplines, mainly in the past 30 years, as texts appear to be increasingly explicit in elaborating concepts and clarifying associations by the use of example, illustration and references to tables and graphical data.

Code glosses, in particular, have grown significantly and by a massive 122% in biology, although this was a discipline which has been a relatively low user of these devices in the past. Such glosses help expand or clarify the meaning of a particular term which may be unfamiliar to readers or which illuminates adjacent material in some way. This is achieved by further specifying, qualifying, describing or extending such terms or material (Hyland, 2007). The exemplification in (42) and the reformulation in (43), for instance, offer on-line elucidation to assist the reader in following the writer's argument by making a new concept or idea immediately accessible to them:

> (42) However, a similar lack of homology is found among actin-binding domains
>   in other proteins <u>such as</u> gelsolin and a-actinin.   (Bio, 2015)

> (43) A human being's experience of life is, <u>in other words</u>, at least partially shaped
>   by the language in terms of which he learns to organize his experience. (AL,
>   2015)

But while writers may present two 'versions' of the same material in this way, alternative formulations of a single idea rarely constitute identical meanings and tend to go beyond strict paraphrase to present what the writer considers to be the key elements of a prior utterance. Code glosses thus not only seek

to clarify a term or idea and so assist comprehension, but also to further the achievement of the writer's communicative purpose by expanding or specifying the meaning.

Endophoric markers play a similar rhetorical role. By referring the reader to another part of the current text (44) or to supporting data (45) they make material salient which is necessary for the reader to recover the writer's preferred interpretations of current text.

> (44) As indicated <u>earlier</u>, business buyers are much better able than consumers to exert pressure to hold down prices on the products they purchase.
>
> (Soc, 1965)

> (45) This necessitated duplicating the characteristics of the controller <u>shown in Figure 3</u>…
>
> (EE, 2015)

The five most common endophoric markers used in both 1965 and 1985 were *fig*., *table*, *above*, *section* and *figure*, with *above* dropping from the list in 2015. These devices bring other evidential material to consciousness or offer further information, generally quantitative, to provide backing for a claim.

Table 2 above shows that endophorics have increased steadily but unspectacularly over the years in all fields and that the more quantitative disciplines make the most use of them, often pointing to tables, figures or other ways of presenting numerical data outside of the linear verbal exposition. The increase in these features perhaps indicates greater awareness of readers' processing needs, or at least greater care in constructing arguments. This augmented support, in turn, may reflect the emergence of new audiences for academic research who are not specialists in the area, encouraged by the need to attract new sponsors for applied research, the fostering of interdisciplinary research by funding bodies and universities, and by the relentless pressure on academics to contribute to 'knowledge exchange' initiatives. This change in the audiences requires changes in rhetorical conventions to accommodate more evidential support to explicate abstract concepts and this may help explain some of the developments we are seeing in these findings.

Evidentials: appealing to textual support

The most dramatic change in the use of interactive features over this period is the huge growth in evidentials, which have more than doubled per 10,000 words to comprise 37% of all features. Evidentials point to sources of information outside the current text either through citation as a primary form as in (46) or explicit evidential markers in (47).

> (46) <u>Bassett and Moss (2004) found that</u> women preferred high and moderate risk takers
>
> as long-term mates over low risk takers...   (Bio, 2015)
>
> (47) <u>According to</u> the symbolic politics framework, politicians promote anti-immigrant
>
> laws by making emotional appeals ...   (Soc, 1985)

Biology (up 43%), sociology (153%) and electrical engineering (216%) have all seen significant rises, but the 1357% increase in applied linguistics is extraordinary. This increase, mainly driven by the massive growth of citation, is from an extremely low base, reflecting a time when the field was in in its infancy and lacking the substantial stock of citable sources it has now with nearly 600 journals listed on the SCImago rankings. Lin and Luyt (2012), when discussing an obscure zoology journal, note a similar situation in that the earliest issues contained no citations at all and these gradually increased with the development of the journal and the field.

The rise of citations in all fields suggests that there are universal factors at work and not only disciplinary ones. The shift to electronic publishing, together with the expansion of publishing outlets, for example, means that there is a greater availability of material which can be easily accessed online. Estimates suggest that about one million authors publish some 2.5 million articles each year in 34,000 peer-reviewed scholarly journals (Ware & Mabe, 2015). Both articles and journals have grown steadily in frequency with the number of journal titles doubling about every 24 years.

Interestingly, accessing sources through hyperlinked citations, has meant that references tend to be more recent and that citations are to fewer journals and articles (Evans, 2008). Following hyperlinks from one paper to another not only changes academics' reading processes, but also reduces the potential to encounter unexpected content (Xia, Myers & Wilhoite, 2010), thereby accelerating

consensus. More importantly, there is now a greater imperative to reference this literature as issues become more complex and interdisciplinary, and the increased literature means that greater support is required to strengthen claims. Relating a study to previous work to establish the relevance and significance of the current work is now an essential part of building a context for research in international publishing, particularly in the more discursive fields, as arguments have become increasing embedded in the conversations of the discipline.

The data also show a shift in the ways that imported information is represented, with a growing preference, in all fields but sociology, away from summarising information from a single source to generalising from several sources. Summarizing remained the predominant presentation format in the hard knowledge fields, however, suggesting there is still greater engagement with a single line of work common in the linear development of knowledge characteristic of the sciences. Quotation also remains low in these fields. Table 4 shows how the patterns of evidentials has changed over the period.

Table 4   Changes in proportion of evidentials by discipline

presentation	Applied linguistics			Sociology			Biology			Engineering		
	1965	1985	2015	1965	1985	2015	1965	1985	2015	1965	1985	2015
generalization	34.1	58.7	53.9	51.5	48.0	46.0	39.2	56.0	46.6	34.1	30.3	45.7
summary	47.7	30.4	33.5	39.6	39.5	41.3	59.5	43.1	51.5	64.3	68.1	54.3
block quote	15.9	6.1	6.1	3.6	4.9	8.1	1.4	0.6	1.7	1.6	1.6	0.0
quote	2.3	4.8	6.4	5.3	7.6	4.6	0.0	0.3	0.2	0.0	0.0	0.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

The movement towards generalisation is perhaps, once again, related to the growth of the research literature and the additional material to acknowledge (Hyland & Jiang, 2017). Clearly it is more economical to craft a generalisation based on several studies than a series of summaries of individual studies, such as this example:

> (48) Edelman (1977, p. 30) argues that by referencing mythical groups' (unnamed
> sources, etc.) news organizations legitimate their views and protect their reports
> from criticism. In their analysis, Potter and Halliday (1990) similarly argue that
> such terms function as rhetorical devices for constructing descriptive accounts of

events and for warranting those accounts as the account of what actually happened. (AL, 2015)

Applied linguistics, for instance, reversed its 1965 preference for summary so that generalisation increased to 54% of all its citations. Generalisation not only allows more references to be brought to bear in support of a position, but also for the position itself to be more persuasively shaped, as these examples from our corpus suggest:

> (49) In this context, control-based approaches are increasingly being used in synthetic biology (Ang et al., 2010, LeDuc et al., 2011, Menolascina et al., 2011 and Yang et al., 2011) where some control theoretical results are applicable, although with various limitations due to biological constraints (Chaves and Gouzé, 2011 and Sontag, 2004). (Bio, 2015)

> (50) A related line of research has shown that lexical coverage (the percentage of known words in a text) affects both reading (Hu and Nation, 2000, Laufer, 1989 and Schmitt et al., 2011) and listening comprehension (Bonk, 2000 and Van Zeeland and Schmitt, 2013). (AL, 2015)

Here we can see writers crafting their arguments by referring to, rather than offering a detailed analysis of, the sourced material; lightly touching the earlier studies as supporting evidence without the need to account for anomalies or potentially complicating detail.

Alongside the growing preference for generalisation, there has been changes in quotation, with both short and block quotes doubling over the period. Both use the original wording of the source but the latter are longer and formatted as indented blocks. Together they still comprise only 7% of all references, with very low numbers in our biology corpus and none in the 2015 engineering sample at all. This growth in block quotes is entirely due to a doubling in their use by sociologists while shorter quotes have only increased because of a growing preference for them among applied linguists. These changes are perhaps related to the discoursal turn in the social sciences influencing the way that secondary sources are handled.

The preference for non-integral citing forms, where the cited authors occur in parenthesis to emphasise the research rather than the researchers themselves, is also strengthening, perhaps because it is a form which allows more succinct presentation, or more rhetorically, because it better represents prior work

as leading to the authors' own research and interpretations. Figure 5 shows the extent of this change across each discipline.

Figure 5 Ratio of non-integral to integral citations
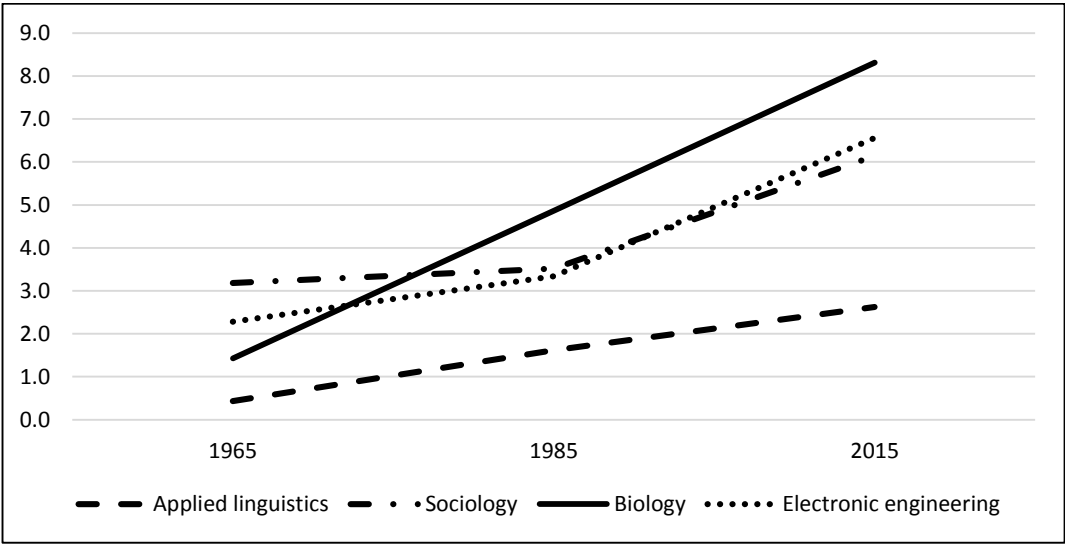
Examples such as (49) and (50) above have increased by over a third during the last 50 years so that integral patterns like (51) and (52) now represent only 15% of all citations in these four fields.

> (51) According to research by Audrey Kurth Cronin (2003), PKK members who
> engaged in suicide bombing did not volunteer, but rather were forcibly co-
> erced to use this tactic.   (Soc, 2015)

> (52) For systems with deterministic processing times Kumar and Seidman (1990)
> have proposed the following scheduling policy:…   (EE, 2015)

The most dramatic shift has been in biology, where non-integral forms have risen from 58% to 90% of all citations, so there is now a ratio of 9:1 in favour of non-integral forms in 2015. The figures for applied linguistics are also worth mentioning as, while starting from a lower base, its use of non-integral citations has risen from 29% to 73% in 2015. It seems that in establishing itself as an independent discipline it has adopted the reporting styles of more established, 'scientific' communities.

Overall, there was a statistically significant increase in interactive features since 1965, with evidentials nearly doubling and code glosses also increasing markedly. Evidentials rose the most in all fields except biology while endophorics and code glosses increased in all fields. To sum up these changes, we see writers endeavouring to enhance the cohesion and explicitness of their arguments to make their

ideas clearer and their texts more persuasive to audiences increasingly targeted outside their specialist area (Trowler et al, 2012).

Conclusions

The last 50 years have seen considerable changes in both research and publication practices in international English-medium arenas. There has been, for example, an explosion of journals, papers, doctoral dissertations and books with the globalisation of research and the encroaching demands of publishing metrics on scholars across the planet; the period has also witnessed the growth of collaboration and multiple authorship; the expansion of access to a massive online literature and the fragmentation and specialisation of research. Perhaps most importantly, there has been a growing imperative in recent years to reach new audiences and funders. Researchers are increasingly required to attract funding from commercial and industrial sponsors while funding bodies use their considerable resources to encourage interdisciplinary research. Universities themselves recognise that they cannot be ivory towers of learning and have to engage with non-academic audiences. The knowledge exchange imperative means that many academics are evaluated on community outreach as well as academic impact. These factors have consequences for rhetorical practices and are reflected in writers' interactive metadiscourse choices.

We see, for example, there has been a considerable increase in an orientation to the reader through a significant rise of 35% (per 10,000 words) in interactive metadiscourse features since 1965. Items in all categories, except transitions, rose with transitions holding steady over the 50 years. Evidentials (up 97%) and code glosses (59 %) saw the highest increases, indicating a perceived need to draw on a massively larger source of published support and to clarify the meanings of potentially unfamiliar terms or complex findings. Analysis of the disciplinary corpora indicate that although interactive features have risen in all the four fields we studied, especially after 1985, there were exceptionally high increases in applied linguistics and electrical engineering. Transitions and evidentials remain the most frequent devices overall and endophorics and code glosses increased in all four disciplines. Writers'

efforts to set out their discourse purposes, text directions, rhetorical connections and conceptual clarifications have increased in recent years and the means they use to achieve these goals have become a more salient feature of research writing.

There seems, therefore, to have been a shift in argumentation styles in academic texts in response to changing contexts where interdisciplinary research and the need to talk to external funders, commercial sponsors and other non-specialists is becoming more important. Furthermore, with metrics-driven assessments coming to dominate academic careers, the ability to not only ensure the comprehensibility of one's arguments but also their persuasive efficacy, is now a professional imperative. The use of interactive metadiscourse to both draw on common understandings and create shared associations where this is possible and to clearly signal connections, frame arguments and support interpretations when it is not, is a key aspect of this use. In this paper we hope to have shown how these personal and collective imperatives for communicating have altered. The model we have used here offers a coherent and principled means of analysing the rhetorical preferences of writers in different communities and how these have changed over time.

Notes
1. Two journals, *TESOL Quarterly* and *Foreign Language Annals*, began only in 1967, and so articles were chosen from issues in that year. *College Composition and Communication (CCC)* is the only one not indexed in SSCI, but it is an influential, long-running journal listed in the language and linguistics subcategory of Arts and Humanities in the Thomson Reuters citation index.

2. Refer to Instructions for Authors (http://www.journals.uchicago.edu/journals/qrb/instruct, accessed at January 29, 2018)

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Appendix 1: Journal list

Applied Linguistics

TESOL Quarterly (1967-)

Language Learning (1948-)

Foreign Language Annals (1967-)

Modern Language Journal (1916-)

College Composition and Communication (1950-)

Sociology

American Journal of Sociology (1895-)

Social problems (1953-)

The British Journal of Sociology (1950-)

American Journal of Economics and Sociology (1941-)

The Sociological Quarterly (1960-)

Biology

The Quarterly Review of Biology (1926-)

Biological Reviews (1923-)

Radiation Research (1954-)

BioScience (1964-)

The Journal of Experimental Biology (1923 -)

Electrical Engineering

Proceedings of the IEEE (1963 -)

Automatica (1963 -)

IEEE Transactions on Automatic Control (1963 -)

IEEE Journal of Solid-State Circuits (1966 -)

IEEE Transactions on Information Theory (1963 -)