

“We must conclude that...”: A diachronic study of academic engagement

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Central to successful research writing is the creation of an appropriate relationship with readers. The ability to craft a text which establishes solidarity, or at least a disciplinary affiliation, both supports a writers' community credentials and helps to head-off objections to their arguments. Partly, of course, this involves addressing topics of interest to the community and using theories and methods that peers recognise as effective, but it also requires careful rhetorical choices suggesting shared beliefs, experiences, expectations, and values (e.g. Swales, 2004; Bazerman, 1988). Academic writers, in other words, do not simply produce texts that discuss a common interest in certain aspects of the world but use language to acknowledge, construct and negotiate social relations. Readers not only need to follow an argument set out in a way they expect, but want to feel that they are being taken into consideration too. Writers must make assumptions, both about the nature of the world and about their audience, which means the ways they present their ideas, signal their allegiances, and stake their claims represent careful negotiations with, and sensitivity to, their colleagues.

Following Hyland (2001; 2005) we refer to this dimension of interpersonality as *engagement*. Unlike the more widely discussed notion of *stance*, this is a reader-oriented aspect of interaction which concerns the degree of rapport which holds between communicative participants. It points to the fact that writers seek to write with the interests, background knowledge and expectations of readers in mind and, more generally, indicates their awareness of the community's epistemological and interpersonal conventions. Engagement thus involves connecting texts with readers and with disciplinary cultures. Despite a growing interest in how writers negotiate knowledge in locally meaningful ways, very little is known of how engagement has changed in recent years and whether such changes have occurred uniformly across disciplines. In this paper we set out to explore this issue using Hyland's (2005) model of engagement. Drawing on a corpus of 2.2 million words taken from the top five journals in each of four disciplines at three time periods, we seek to determine whether reader engagement has changed in academic writing over the past 50 years.

1 The concept of reader engagement

Engagement is the ways writers rhetorically acknowledge the presence of their readers in a text. Hyland defines it in this way:

This is an alignment dimension where writers acknowledge and connect to others, recognising the presence of their readers, pulling them along with their argument, focusing their attention, acknowledging their uncertainties, including them as discourse participants, and guiding them to interpretations. (Hyland, 2005: 178)

It therefore turns on the degree to which writers present themselves as sharing, or perhaps failing to share, attitudes and how they manage solidarity and affiliation.

This use of 'engagement' has been developed independently of that proposed by Martin and White (2005) who use the term to refer to the ways writers position themselves to other voices. This is closer to the notion of stance and the resources for conceding, attributing, hedging, boosting and otherwise modalising the status of an utterance. This view focuses on the writer and his or her attitude towards propositions. In contrast, we are concerned with how language is used to head-off possible reader objections and bring them into a text. Engagement in this paper therefore refers to the overt marking of what Thompson (2001) calls the 'reader-in-the-text'.

While the term is relatively new, theorizing about the general notion of engagement is not. Linguists have long been concerned with the interpersonal functions of language and how individuals establish connection and affiliation. Brown and Gilman's *Pronouns of Power and Solidarity* (1960), the extensive *politeness* literature based on Brown and Levinson's (1987) work, Sacks and Schegloff's (1974) concept of *recipient design*, the notion of *relevance* (Sperber & Wilson, 1995) and more recently, the *appraisal framework* (Martin and White, 2005) have all contributed to our understanding of this idea. In academic writing, Myers (1989), Adel (2006), Biber (2006) and Hyland (2001; 2004) have sought to show how interaction is not only achieved by the projection of authorial stance but by language choices which display an orientation and sensitivity to readers. Through engagement choices writers seek to effect interpersonal solidarity and co-membership of a disciplinary in-group.

The notion of engagement therefore takes seriously the Bakhtin-inspired view that all verbal communication is dialogic (Bakhtin, 1982). Even the most “monologic” text involves the speaker/writer in responding in some way to what has been said before on the subject by others and in anticipating in some way how those addressed will themselves react to what it being asserted. Clearly, to be successful, academic arguments must always incorporate the active role of an addressee and be understood against a background of other opinions and viewpoints. A research paper thus locates the writer intertextually within a larger controversy and within a community whose members are likely to both hold a position on the issue under debate and to recognise only certain forms of argument as valid.

To understand writing as dialogic means examining discourse features in terms of the writer’s projection of the requirements, perceptions and interests of a potential audience. The notion of audience however is a slippery one in published texts as academic research may have multiple audiences, and be read by specialists, students, practitioners, lay people and interested members of the discipline, hardly a homogenous grouping. Myers (1989: 4) identifies two broad groups who are the target audience of a research article: the *exoteric*, or wider scientific community, and the *esoteric*, individual researchers doing the same work. Respect must be paid to the former while addressing the latter. But while engagement implies the presence of readers as a necessary partner in the act of writing, audience is rarely a concrete reality in academic environments. Essentially it represents the writer’s awareness of the circumstances which define a rhetorical context, so that writers *construct* an audience by drawing on their knowledge of earlier texts and relying on readers’ abilities to recognise intertextuality between texts. This view highlights the dialogic role of discourse in predicting a reader’s reaction and in responding to a larger textual conversation among members of a discipline.

The role of engagement is therefore rhetorical, concerned with galvanising support, expressing collegiality, resolving difficulties and heading off objections (Hyland, 2004; 2005; Myers, 1990). By anticipating their background knowledge, interests, and expectations, a writer can seek to monitor readers’ understanding and response to a text and manage their impression of the writer. At root, then, academic engagement is predicated on the writer’s awareness that readers can always refute

claims, which means readers have an active and constitutive role in how writers construct their arguments. This social constructionist view therefore locates participant relationships at the heart of academic writing, assuming that every successful text must display the writer's awareness of both its readers and its consequences.

2 Studying engagement

Affiliation is, of course, created in numerous implicit ways and is highly contextual. The selection of a particular topic or arcane methodology, referencing certain theorists or approaches, or even the choice of one word over another can all signal insider attachments which may be opaque to the analyst. Nor is it always marked by words at all: a writer's decision not to draw an obvious conclusion from an argument, for example, may be read by peers as a significant absence. It may not always be possible therefore to recover the community understandings embedded in more implicit realisations. As outsiders we have only the text to guide us and so the notion of engagement focuses on the surface features in texts, the points at which writers intervene to introduce readers as real players in the discourse, rather than merely as implied observers of the discussion, to build a connection with them.

Hyland (2005) argues that there are five main ways which academic authors explicitly intrude into their texts to connect with readers directly. At certain points writers acknowledge an active audience using the following:

- **Reader mentions** bring readers into a discourse, normally through second person pronouns, particularly inclusive *we* which identifies the reader as someone who shares similar ways of seeing to the writer.
- **Questions** invite direct collusion because they address the reader as someone with an interest in the issue the question raises and the good sense to follow the writer's response to it.
- **Appeals to shared knowledge** are explicit signals asking readers to recognise something as familiar or accepted (*obviously, of course*).
- **Directives** are instructions to the reader, mainly expressed through *imperatives* and *obligation modals*, which direct readers a) to another part of the text or to another text, b) how to carry out some action in the real-world, or c) how to interpret an argument.

- *Personal asides* briefly interrupt the argument to offer a comment on what has been said, adding more to the writer-reader relationship than to propositional development.

As we have observed, engagement choices are selected from a restricted sub-set of options which reveal how the writer understands his or her community. A text anticipates a reader's response by displaying the writer's assumptions about the beliefs and expectations of the community for which it is written. In academic writing there appears to be two main purposes to these reader appeals:

1. The first is primarily interpersonal and acknowledges the need to sufficiently meet readers' expectations of inclusion. Here then, we find readers addressed as participants in an argument with reader mentions and asides to effect solidarity and membership of a disciplinary in-group.
2. The second purpose seems more to do with rhetorically positioning the audience, recognising the reader's role as a critic and potential negater of claims by predicting and responding to possible objections and alternative interpretations. Here the writer pulls the audience into the discourse to guide them to interpretations with questions, directives and references to shared knowledge.

The significance of engagement and its relationship to the epistemologies and research practices of different disciplines has been demonstrated in a number of studies. Thus McGrath and Kuteeva (2012), for example, examined disciplinary writing practices in pure mathematics, revealing higher than expected shared knowledge markers and reader references while Koutsantoni (2004) shows how electrical engineers referred to shared knowledge to present new claims as consensual understandings. The fact that engagement choices reflect disciplinary practices rather than individual decisions is indicated by Hyland's (2001) findings that philosophers employ *ten times* more devices than biologists and that the more discursive 'soft' fields employ more reader-oriented markers than the hard sciences. Hu and Cao (2015) similarly show that applied linguists deploy more reader references than psychologists and that quantitative research articles tend to have higher frequencies of directives than qualitative articles. Hyland (2005; 2009) also shows that while reader pronouns and directives are overwhelmingly the most frequent engagement markers in academic writing, the former are more common in the soft knowledge fields and the latter more frequent in the physical sciences.

Comparisons have also been made in the ways patterns of engagement not only differ across disciplines, but also vary by genre and language, revealing how writers shape their texts to the expectations of different audiences. Thus we find differences between expert texts and undergraduate dissertations (Hyland, 2004) and between popular and professional science articles (Hyland, 2010). There also seem to be cross-linguistic influences in engagement patterns. For instance, Lafuente-Millán (2014) found that while the context of publication and national culture are powerful factors regulating the use of engagement, L1 transfer and L2 proficiency may also have some bearing. In this paper, we focus on diachronic change in one genre and one language, the research article in English, mapping, and attempting to explain, the use of language across three points in time. In what follows we briefly outline the model and our methods and then go on to discuss our findings.

3 Corpus and method

To track changes in engagement over time we created three corpora taking research articles from the same five journals in four disciplines spaced at three periods over the past 50 years: 1965, 1985 and 2015. The different time spans were chosen to see if changes were more pronounced in the later or earlier period, although we were concerned with overall changes over the 50 years. Applied linguistics, sociology, electrical engineering and biology were selected as representative of both the soft applied fields and the hard sciences (Becher & Trowler, 2001), and we took six research articles at random from each of the five journals which had achieved the top ranking in their field according to the 5 year impact factor in 2015¹. 30 articles in total for each discipline each year. The journals are listed in Appendix 1 and together the corpus comprised 360 papers of 2.2 million words as shown in Table 1. It is immediately apparent that there has been a massive increase in the length of articles over this period:

Table 1: Corpus characteristics

Discipline	1965	1985	2015	Overall
Applied linguistics	110,832	144,859	237,452	493,143

¹ Two journals, *TESOL Quarterly* and *Foreign Language Annals* only began in 1967 and so papers were chosen from issues in that year.

Biology	244,706	263,465	237,998	746,169
Electrical engineering	92,062	97,545,	235,681	425,288
Sociology	149,788	196,232	262,203	608,223
Totals	597,388	604,556	973,334	2,272,823

The corpora were part-of-speech tagged and then searched for engagement features using the concordance software *AntConc* (Anthony, 2011). Overall we examined 100 different items (see Appendix 2), searching for both US and British spellings, and manually examined and counted each concordance to establish that the feature was addressing readers directly. Most obviously, this involved eliminating exclusive *we* (“we drained the liquid”), occurrences in quotations, and non-addressee modals (“policy-makers should consider”). Some features are very easily identified through a corpus word-search (you, the reader, obviously) while others involved a regular expression search (imperatives, it is adj to + verb), or a careful reading of individual texts (commas, dashes to mark asides). The two authors worked independently to code a 10% sample, gradually refining our agreement through successive passes to achieve an inter-rater reliability of 96%.

Once all the papers were read and coded, the frequencies of features in each category, year and discipline were calculated (per 10,000 words). We discuss the results in the following sections.

4 Changing patterns of Engagement: a quantitative overview

Overall we found almost 4000 engagement features in the papers published in 2015, amounting to 40.3 cases per 10,000 words. However, while Table 2 shows an increase in engagement markers in academic writing over the past 50 years, with a massive 42% rise in raw numbers, there turns out to have been a significant *decrease* when we adjusted for the large rise in the length of papers ($\log \text{likelihood} = 29.82$ $p < 0.001$). The figures show that the increase in published words is accompanied by a slight dip in authors’ explicit engagement choices until 1985 and then a considerable rise once again to the present, although this seems to have been entirely due to the longer texts.

Table 2: Distribution of engagement features over time

	1965	1985	2015	% change
Total items	2756	2685	3918	42.2%

Per 10,000 words	46.1	44.4	40.3	-12.7%
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This relative decline is not evenly distributed across the four disciplines studied but is confined to the soft knowledge fields of applied linguistics and sociology. We can see from Table 3 that writers in applied linguistics and sociology substantially reduced their use of engagement when figures are adjusted for increased length of papers ($LL = 86.60, p < 0.001$; $LL = 110.06, p < 0.001$). Speculatively, this may result from an increase in more empirically-oriented and quantitative studies, which restrict opportunities for overt engagement, or is perhaps due to the influence of growing numbers of second language writers schooled in the virtues of objective writing styles. Biology and electrical engineering authors, on the other hand, have increased their use of engagement, particularly over the last 30 years (although not so significantly as the two soft disciplines), frequencies in electrical engineering proportionately now exceed the other disciplines studied.

Table 3: Changes in engagement over time by discipline (raw numbers & per 10,000 words)

Discipline	1965	1985	2015	% change
Applied linguistics	678 (54.4)	623 (43.0)	898 (37.8)	32.4% (-30.5%)
Sociology	902 (55.2)	861 (44.9)	968 (36.9)	7.3% (-33.2%)
Biology	634 (25.9)	675 (26.2)	691 (28.3)	9.0% (9.3%)
Elec engineering	542 (50.6)	526 (55.0)	1361 (55.3)	151.1% (9.3%)
Totals	2756 (46.1)	2685 (44.4)	3918 (40.3)	42.2% (-12.7%)

We were surprised by these overall trends. An extensive literature, some of which is discussed above, confirms that academic disciplines are distinguished as much by their argument patterns as by their epistemological assumptions or research topics. The ways readers are represented in texts contribute to this. The more interpretive, less abstract nature of knowledge in the social sciences and humanities calls for a stronger recognition of alternative voices and appeal to solidarity with readers, so texts are characterised by more extensive use of engagement markers. Writers in the hard-disciplines, on the other hand, have tended to downplay interactional positions, which result in a less reader-inclusive rhetoric which places greater stress on the impartiality and linearity of science production. The frequencies in Table 3, however, indicate possible changes in argument patterns and how writers negotiate claims with their readers.

Engagement features, however, are not changing in a single direction nor behaving in uniform ways, either across times or disciplines. Table 4 shows that although asides and explicit references to shared knowledge have fallen steadily since 1965 in all four disciplines, especially in applied linguistics, other features have not behaved so neatly. Questions and directives have remained fairly stable except in biology, where questions have more than doubled, although they remain relatively infrequent, and electrical engineers have substantially increased their use of directives. Reference to readers has declined sharply in all fields except electrical engineering, especially between 1965 and 1985.

Table 4: Changes in engagement features by discipline (per 10,000 words)

	Applied linguistics			Sociology			Biology			Elec engineering		
features	1965	1985	2015	1965	1985	2015	1965	1985	2015	1965	1985	2015
Reader mention	7.6	5.6	4.7	12.5	7.5	4.4	3.6	1.8	1.8	2.3	3.5	3.8
Questions	4.7	4.6	4.0	6.8	4.7	4.3	1.3	1.7	3.2	0.8	0.6	0.5
Knowledge reference	15.6	12.7	11.0	18.9	16.1	13.5	12.3	9.4	8.8	18.8	17.0	14.5
Directives	16.6	16.1	15.3	12.7	13.2	12.6	11.6	11.2	12.6	25.2	30.6	34.4
Asides	9.9	4.0	2.8	4.3	3.4	2.1	2.7	1.9	1.9	3.5	3.3	2.1

Overall these data suggest that electrical engineers have taken some steps towards greater reader-visibility and interpersonal engagement while the other fields have been slowly moving towards more objective, less explicitly interactive prose. We discuss these changes in more detail below, but it may be that we are witnessing a shift in how these disciplines craft academic argument and their members seek to persuade peers.

5 Reader mention: soliciting solidarity

Explicitly referring to the reader is the clearest signal that the writer is considering the presence of an active audience in an argument. The most unequivocal acknowledgement of the reader, however, second person *you* and *your*, occur only rarely in the corpus and almost never in the science and

engineering texts. Even applied linguists and sociologists have increasingly shunned the use of second person over the past 50 years, usage by the latter falling from 5.0 to 0.5 words per 10,000. Table 5 represents this decline. This widespread and increasing avoidance perhaps indicates that writers may be reluctant to engage their interlocutors in such an explicitly direct and personal way, a trend which is line with the decreasing use of stance markers in academic writing over this period (Hyland & Jiang, 2016).

Table 5: Changes in reader mention over time (per 10,000 words)

features	1965	1985	2015
you/your	1.7	1.3	0.3
one/reader	0.3	0.8	0.5
we/our/us	4.4	2.7	2.6

Second person and indefinite pronouns only occasionally address readers as disciplinary colleagues asked to unpack the topic with the author. They usually carry a more encompassing meaning, addressing the reader as an everyman scholar who is not a specialist but an intelligent person interested in the topic and able to follow the logic of the writer’s argument:

- (1) For example, if *you* break the law, *you* can expect to be arrested, but if *you* go along quietly, *you* can, unless there is a special circumstance, expect to be treated reasonably. (Soc)

- (2) That is, though *you* can see words, *you* cannot see ideas or content. If *you* cannot see content, *you* have no proof that it exists. What *you* cannot prove the existence of, they say, *you* have no business theorizing about. (AL)

The reader is thus pulled into the text as a partner, recruited by the writer to unravel a knotty problem together. This is also achieved using the indefinite pronoun *one*, a form which has increased enormously in applied linguistics in particular (up 4-fold to 1.1 per 10,000 words) and which is now over twice as frequent as *you* in that discipline:

- (3) Thus, *one* cannot conclude that the FSL subjects were less accurate' than the other subjects, and therefore, responded more quickly in the visual condition as a speed/accuracy trade-off. (AL)

- (4) If *one* assumes, uncontroversially, that the agrammatic aphasia of the deVilliers subjects affects inflectional morphology, then a plausible conclusion might be that the L2 learners are also somehow impaired. (AL)

Writers therefore seek to identify with their readers, anticipating and voicing their concerns in an unfolding text, but at the same time they are also using these devices to predict their readers' lines of thought to head off objections. This suggests the declining frequency of *you* may not only be due to its over-personal connotations, but because writers are concerned about the potential distancing which the pronoun can imply. *You* can be easily contrasted with *I* and the implication of a stark detachment between the author and reader can clearly undermine attempts to construct a joint intellectual journey. Inclusive *we*, on the other hand, suggests a shared interpretation and collective goal. While unquestionably dialogic in that it takes the readers' viewpoint on an issue into account, *we* addresses readers from a position of dominance, guiding them through an argument and towards a preferred conclusion. Pronouns thus claim authority as well as collegiality; they are dialogic, but it is a dialogue designed to coax compliance with the author's claims.

It may be the case that writers feel they have less space for expressing their awareness of the presence of their readers over the years, emphasising transactional over interactional aspects of their texts, but it is more likely that it is the transparency of the rhetorical strategy of reader mention which is responsible for its decline since 1965. In contrast to the overall picture, however, electrical engineers have increased their use of reader mention by over 65% to 3.8 per 10,000 words over the period. While the reasons for this are unclear, it may be related to the possibility that engineers are under pressure to produce knowledge for wider fields of interest. They are increasingly reaching out to new audiences in only peripherally related areas, often outside academia itself, in the commercial world which funds much of its research. More interventionist engagement strategies, which seek to explicitly pull readers along towards particular viewpoints may therefore help compensate for a less certain ability to rely on the persuasive efficacy of in-group understandings of methods, theories and the significance of findings.

- (5) These results broaden *our* understanding of bucket brigade devices and their potential role in new areas of application. (EE)

(6) *We* can see that the algorithm is practical for solving the problems identified. (EE)

(7) Therefore, if *we* consider the friction force as a threshold, *we* can suppose that the output force of SDA is nearly zero below the threshold and increases radically with the pulse peak (EE)

As these examples suggest, this audience-orientation extends into explicitly spelling out the conclusions the writer wants the reader to draw.

6 Questions: constructing involvement

Questions drive all academic research and occasionally surface in the pages of research papers. They are explicit engagement features as they invite collusion with readers: addressing them as having an interest in the problem posed by the question, the ability to recognize the value of asking it, and the good sense to follow the writer's response to it. Lim (2012), for instance, has shown how writers frame questions relating to previous studies to create a gap justifying their research. Similarly, Chang and Schleppegrell (2011) have found rhetorical questions to be a valuable strategy for capturing readers' attention. Questions, then, are the strategy of dialogic involvement par excellence, serving up an invitation for readers to orientate themselves in a certain way to the argument presented and to enter a frame of discourse where they can be led to the writer's viewpoint (Hyland, 2002a). As Webber, in her study of medical journals, points out:

Questions create anticipation, arouse interest, challenge the reader into thinking about the topic of the text, and have a direct appeal in bringing the second person into a kind of dialogue with the writer, which other rhetorical devices do not have to the same extent. (Webber, 1994: 266)

Some writer recognize the dialogic value of questions to draw the reader in from the outset, opening with a question to create interest and clearly set out the topic the paper will respond to. This both invests the issue with significance and invites the reader to explore it in partnership with the writer, sharing his or her curiosity and following where the argument leads. Sometimes these are the research questions which have guided the study (8) while others simply tease the reader's curiosity (9):

(8) Conditional on successfully detecting multivariate structure, we looked to answer two related but conceptually distinct questions: (i) which metrics vary coherently across samples and are therefore associated? (ii) which metrics best explain sample patterns overall? (Bio)

(9) Given that we have only a specified number of hours to give the trainee information about the grammar of the English language, precisely what aspects or segments of all that is known about the subject do we teach him? (AL)

Generally, however, questions are overwhelmingly rhetorical, presenting an opinion as an interrogative to position the reader to construct involvement, often simultaneously initiating and closing the dialogue:

(10) Does this suggest that mycorrhizal funi are sometimes parasitic on plants? Technically it might be an accurate description of some mycorrhizal associations where the fungus is detrimental to the plant or vice versa. (Bio)

(11) What is the basis for optimism for making large-scale quantum computation work with qubits that are so unstable? The answer is: a large amount of carefully designed redundancy, both in memory and in logic. (EE)

Once again, these engagement devices have declined in the soft knowledge fields, and by over a third (per 10,000 words) in the sociology papers, reflecting changing argument patterns in these disciplines. Biologists, in contrast, have begun to embrace them with some enthusiasm, more than doubling their use over the past 50 years.

The interpersonal effect of questions, and something of the rhetorical impact which engagement with readers which can be achieved, can be seen from the extract below:

(12) Even if *we* assume that protoplasm began evolving by selection on mineral surfaces long before it became bounded in protocells, this model only helps *us* explain the origin of cellular life if neighborhood selection would favor the evolution of protocells. But why should it? Wouldn't *we* just end up with mineral surfaces being coated in more and more complex mixes of chemicals, with newly exposed surfaces being colonized more and more quickly? Why would selection acting on surface-bound protoplasm ever result in the formation of lipid-bounded protocells? (Bio)

The questions are interjected on behalf of the intelligent reader who is brought into the text with the help of inclusive *we* pronouns, implying a cooperative effort to address a disciplinary problem. This is a powerful rhetorical strategy as the writer brings the reader along towards a pre-determined conclusion. The passage is almost relentless in the way it positions the reader in relation to the writer and to the issue at hand, presupposing the reader's response as well as the reasonableness of the questions themselves. This strategy, moreover, represents an increasingly common practice in the sciences and a departure from the faceless empiricist stereotype which merely sets out results from which readers are allowed to draw their own conclusions (e.g. Hyland & Jiang, 2015).

7 Knowledge appeals: claiming membership

Less imposing than questions and less directly personal than reader pronouns, is the use of appeals to shared knowledge. These are fairly common in professional research writing where academics seek to position readers within the apparently naturalised and unproblematic boundaries of disciplinary understandings (Hyland, 2001). Readers can only be brought to agreement with the writer through building on what is already implicitly agreed, and by explicitly referring to this agreement writers construct themselves and their reader as members of the same academic community.

The notion of what can be reliably considered 'shared', however, is clearly problematic and writers may misjudge or, more often, deliberately exploit what is controversial for rhetorical ends. The use of jargon, acronyms, preferred metaphors, and so forth all foreground a common frame for seeing the world and resolving issues. Often, however, constructions of solidarity involve direct and explicit calls for the reader to recognise something as accepted by virtue of common knowledge or their disciplinary membership, as here:

(13) *It is well known* that the direction of the hysteresis loop from the MIS capacitor due to surface-state trapping should be clockwise. (EE)

(14) *Obviously*, motivation is a key factor in both goal setting and goal attainment. (AL)

These markers both invite readers into the argument and construct them as fellow travellers through a disciplinary landscape, recognising its familiar features and sharing a common destination.

Overall, there has been a decline in the use of these markers of shared knowledge in all four disciplines over the past 50 years of around 20% (per 10,000 words) with 30% drops in applied linguistics and sociology. Interestingly, however, there have been considerable differences in the type of knowledge appealed to. Here we recognise three broad categories of marker (examples given below):

1. Logical reasoning – concerned with the coherence of the argument
2. Routine conditions – concerned with usual circumstances or behaviour of real world objects
3. Familiarity with tradition – concerned with usual community practices and beliefs

As can be seen from Table 6, markers relating to the first two types, reasoning and conditions, have fallen dramatically across all fields, while those referring to typicality have risen in three and remained steady in sociology. These changes represent a shift in what authors feel confident they can ask readers to recognise as shared between them or, at least, accept for the moment. Perhaps the expanding readership of research across the world leads writers to suppose less homogeneity in their audiences and so less certainty that they are likely to draw the same conclusions from an argument or knowledge of real world conditions. It may simply be safer to make assumptions regarding what they might be expected to know of usual practices, or at least to project assumptions of this kind to involve readers as fellow-travellers in an exploratory journey. Overall, however, writers are also constructing their readers by presupposing that they hold shared beliefs or understandings, and it seems that this has come to be seen as not always the best strategy.

Table 6: Changes in types of knowledge reference over time by discipline (per 10,000 words)

Patterns	Applied linguistics			Sociology			Biology			Elec engineering		
	1965	1985	2015	1965	1985	2015	1965	1985	2015	1965	1985	2015
Logical reasoning	8.6	3.5	0.9	7.3	5.1	2.4	4.2	3.1	1.6	5.7	4.1	1.5
Routine conditions	0.8	1.0	0.8	0.8	0.6	0.7	3.6	1.4	0.5	4.7	2.1	0.3
Tradition & typicality	6.2	8.2	9.3	10.6	10.4	10.4	4.5	4.9	6.7	8.4	10.8	12.7

Figures show the greatest fall is in those markers which appeal to readers to accept the logical reasoning behind the argument being presented. These have declined by 76% overall when normed for text

length ($LL = 173.12$, $p < 0.001$). The forms *of course* and *obviously* are the most common ways of achieving this and although both are often regarded as markers of epistemic stance, indicating the writer's certainty in a proposition, they can also realize engagement meanings by moving the focus of the discourse away from the writer to shape the understandings of the reader:

(15) *Obviously*, the only reliable conclusion for the presence of a maternal transcription factor can be obtained by using specific antibodies; therefore, many data concerning maternal factors should be reevaluated. (Bio)

(16) The total number of integration points should, *of course*, grow with the value of the radial source-observer distance p to keep a fixed accuracy. (EE)

This is perhaps the most manipulative form of shared knowledge engagement as it seeks to manoeuvre readers into accepting the conclusions of an argument through presupposing their agreement with its assumptions.

Equally, these forms can function to concede ground to alternative positions while inviting readers to step into the space created by the writer for a collaborative exploration of the issue:

(18) *Obviously*, it would be advantageous to have the numerical flexibility of changing the effective dielectric constant for each section of the microshield filter and this can be easily done in the future. (EE)

(19) This may well help to produce easily quantifiable results but *obviously* sacrifices the crucial criterion of naturalness in test conditions. (AL)

This strategy clearly positions readers, asking them to cooperate in building the argument by conceding a point, only to bring them to agreement with a counter argument introduced by *but* or *however*. It is, then, the concession which seeks to engage and turn the reader. Today, however, authors appear to be far less ready to call up sharedness in this way, perhaps because of the risk of such a transparent strategy, but also to avoid too readily anticipating the reader's possible doubts about the argument.

We also find a decline in appeals to readers' knowledge of the regular conditions under which research processes can be effected. Rarely employed in the soft disciplines, these have declined by 90% in the sciences over the last 50 years ($LL = 110.10$, $p < 0.001$), suggesting that writers may have less confidence in their readers' ability to recover background knowledge about experimental practices. Possi-

bly as a result of changing audiences with less knowledge of specialist techniques, so that examples such as these are becoming scarcer:

(20) Limulus *normally* exhibits a gain of 1.5 to 2.5 log units in visual sensitivity during dark adaptation from moderate levels of illumination. (Bio)

(21) These circuits are thermally stable with low residual stress and are *routinely* dipped in liquid nitrogen (77 K) or liquid helium (4 K) with no observed failures. (EE)

Instead, we see an increase in all disciplines of engaging readers as cooperative participants by appealing to their assumed familiarity with aspects of background information, rather than research practices, and brought to centre stage by markers such as *typically*, *common* or *as a rule*. This less imposing involvement strategy may draw on wider everyday understandings, but more often seeks to position readers within the borders of disciplinary knowledge:

(22) Though we recognize that some mainstream composition professionals may find some of these concepts *familiar*, we expect that the second language spin provided here will be less *familiar*. (AL)

(23) The branching procedure is *conventionally* represented as a search tree (EE).

As the first example suggests, such appeals often set up a contrast between the current study and understandings established by previous work to create a gap for the novelty of the paper. Overall, however, this explicit claiming of shared disciplinary membership helps bring the writer and reader together into the same discursive space where claims can be more effectively negotiated.

8 Asides: intimating sharedness

Writers not only seek to suggest a communal endeavor with readers through inclusive pronouns and references to shared knowledge, they also address them directly through asides, interrupting the ongoing discussion to offer a meta-comment on an aspect of what has been said. While generally thought to be a feature of writing in the more discursive fields, where readers must be drawn in and involved as participants to a greater extent than in the physical sciences, they also occur in the electrical engineering and biology texts. Their effect can be seen in these examples:

(24) Freud (poorly read and little appreciated by Sociologists until 20 years ago) had seen the problem clearly. (Soc)

(25) A description of *Tetracoccus cechii* sp. nov. (named in honour of Jakub Cech, one of the first people to report 'G' bacterium) is an ability to use citrate, mannitol, glycerol and ethanol as sole carbon and energy sources. (Bio)

Here the material marked off in parentheses is neither grammatically or rhetorically related to the surrounding sentence and adds little to the argument or to the propositional development of the text. Instead it is an explicit intervention of the writer to engage directly with readers.

This initially appears, perhaps, as a more writerly, stance-taking strategy as the writer offers an opinion on the matter at hand. However, the fact the aside does not push the argument along by offering an explanatory gloss or example of what precedes it suggests a more reader-aware motivation. By turning to the reader in mid-flow, the writer acknowledges and responds to an active audience, offering a remark that is largely dialogic and interpersonal. The writer introduces the audience into the text because he or she wants to reinforce a relationship at that point. It is an intervention simply to connect, to show that they are all, writer and readers alike, engaged in the same pursuit and can draw on shared understandings, if not of actual content, then at least of what might be considered a relevant aside.

Essentially, these diversions project readers into the discourse to forefront a personal relationship, uniting writer and reader through candour or a shared understanding of matters. In (26) and (27), for example, both writers engage readers by referring explicitly to their own practices or experiences, establishing the personal reliability of their discourse:

(26) The enzyme preparation for this study was Novo's Lipozyme, which is a fungal lipase from *Mucor miehei* immobilized on macroporous synthetic resin (an enzyme which has been used in our laboratory for over four years now). (Bio)

(27) We hear almost nothing about this, but - at least based on my experience - establishing strong working relations with low and middle level bureaucrats often results in changed political behavior on the part of movements. (Soc)

Despite the potential value of this strategy, however, these markers have declined considerably over the period in all disciplines ($LL = 70.29, p < 0.001$) and by 70% in applied linguistics. Speculatively,

this is perhaps because of the intimacy this interjects into the discourse. Asides do not depend on an assessment of possible comprehension problems or objections to an argument but can be effective precisely because of this. Like second person pronouns, asides refer to readers directly, their very unexpectedness pauses the on-going argument and arrests the reader's attention. However, pulling readers into the text through personal involvement no longer seems to be favoured as a way of establishing a professional connection.

9 Directives: managing readers

Directives are utterances which instruct the reader to perform an action or to see things in a way determined by the writer (Hyland, 2001; 2002b) and they remain by far the most frequent devices used to initiate reader participation in academic texts, comprising some 56% of all forms. They are typically realised by an imperative (28); by a modal of obligation addressed to the reader (29); by a first person inclusive let-imperative (30); and by a predicative adjective expressing the writer's judgement of necessity/importance controlling a complement *to*- clause (31):

(28) *See* text for discussion of the statistical analyses and curve fitting. (Bio)

(29) Such transformations *should* be studied in terms of the semantic and ideological transformations they entail. (AL)

(30) For the sake of simplicity, *let us* consider a one port admittance element with a real pole-residue pair, p and k . (EE)

(31) But *it is important to* recognize that institutional power is subject to competition and monopoly as well. (Soc)

In each case there is a clear reader-oriented focus as the writer signals a recognition of the dialogic dimension of research writing, intervening to direct the reader to some action or understanding.

As can be seen in Table 7, modals remain the preferred form overall, although frequencies have fallen across all disciplines by nearly two thirds. Modals have been replaced by imperatives as the directive of choice for academics, rising by 230% and becoming the main form in all fields but sociology. The

other patterns have remained steady over 50 years except for the *let us/let's* form in electrical engineering.

Table 7: Changes in patterns of directives over time by discipline (per 10,000 words)

patterns	Applied linguistics			Sociology			Biology			Elec engineering		
	1965	1985	2015	1965	1985	2015	1965	1985	2015	1965	1985	2015
Modal + V.	13.4	9.5	7.3	10.9	8.0	6.4	7.2	6.7	5.9	15	13.8	10.1
<i>let us/let's</i>	0.5	0.6	0.2	0.4	0.3	0.3	0.2	0.1	0.2	0.7	1.7	5.2
Imperatives	2.4	5.9	7.3	1.0	4.3	5.5	3.8	4.3	6.2	9.0	14.5	18.7
Adj. to V.	0.3	0.1	0.5	0.4	0.6	0.4	0.4	0.1	0.3	0.5	0.6	0.4

The emergence of imperatives as an engagement feature at the expense of modals might be understood in terms of their potential interpersonal impact. Hyland (2001) notes that because directives seek to engage and position readers, they carry strong connotations of unequal power, claiming greater authority for the writer by requiring readers to act or see things in a way determined by the writer. This is most apparent with necessity modals, which come closest to violating the conventional fiction of democratic peer relationships in research writing and are most unequivocal in their attempt to control the reader, as here:

(32) It *must* be understood, however, that there are wide variations in applications that describe themselves as "interactive multimedia" . (AL)

(33) One *should* be aware that the identification of an mRNA as a maternal component does not necessarily prove the presence of the corresponding protein. (Bio)

Imperatives, on the other hand, impose far less on the reader. This is especially the case with those most frequently used in the corpus: *note, let, see, consider, suppose, notice* and *assume*. The fact that they carry less threat to the reader's face may account for why they have increasingly replaced modals as directives.

Another change worth mentioning here concerns *let us/lets* which has seen a seven-fold increase in electrical engineering over the period but remained unchanged in the other fields. One advantage of this form, of course, is its inclusivity: the effort made by the writer to bring the reader into the process of considering and interpreting data as a partner, as we can see here:

(34) *Let us* consider generalizations of Parseval's theorem a little further. (EE)

(35) *Let us* try to interpret the structure function. (EE)

(36) As a simple example, *let us* have a look at the circuit level model of a bipolar transistor. (EE)

This is a particularly useful rhetorical strategy in electrical engineering where, as we mentioned above, authors are often presenting research to a more heterogeneous and uncertain audience than in the past. This audience may include non-specialists and those from the commercial world who, in their rapid search for bottom-line results, are likely to value the kind of clarity and succinctness that this structure brings to the presentation.

It should be remembered, however, that directives introduce readers into the text in order to move them in a particular direction: often focusing attention and emphasizing important points. Hyland (2002b) argues that these features direct readers to three main kinds of activity. They can guide readers to another part of the text or to another text using *textual acts* (e.g. *see Smith 1999, refer to table 2*); instruct them how to carry out some action in the real world through *physical acts* (e.g. *open the valve, heat the mixture*); or lead them through a line of reasoning to steer them to certain conclusions using *cognitive acts* (e.g. *note, concede or consider* some argument). Table 8 shows how the increase in directives over the last 50 years has largely been driven by an increase in textual acts and by the growth of physical acts in electrical engineering.

Table 8: Changes in functions of directives over time by discipline (per 10,000 words)

	Applied linguistics			Sociology			Biology			Elec engineering		
Patterns	1965	1985	2015	1965	1985	2015	1965	1985	2015	1965	1985	2015
Textual acts	6.1	7.8	8.1	3.7	4.4	5.9	4.1	4.9	6.7	4.2	7.6	9.6
Cognitive acts	4.6	4.8	5.4	3.0	3.2	3.2	3.4	2.5	1.9	8.9	8.4	4.3
Physical acts	5.9	3.5	1.8	6.0	5.6	3.5	4.1	3.8	4.0	12.1	14.6	16.4

Cognitive acts have fallen by around 50% in the physical science fields. These are potentially the most risky kind of directive as they function to position readers by telling them how they should understand something in the text, thereby leading them to a particular interpretation:

(37) *Note* that the degree of sensitivity with which the curvature varies with reduction ratio is remarkable (EE)

(38) *It is important to* recognise that social norms, as prescriptions serving as common guidelines for social action, are grounded in values and attitudes. (Soc)

(39) Now *consider*, for both NS and NNS, the more crucial findings on regular verbs, where there was a significant anti-frequency effect. (AL)

The danger of creating a negative impression using cognitive directives may account for the move away from these overtly positioning functions and towards directives which are somewhat less manipulative. In electrical engineering we see, for example, a substantial increase in physical acts, which offer a clear and pithy experimental instructions:

(40) The values of the arctan function *should* be taken between $-\pi/2$ and $\pi/2$. (EE)

(41) The continuous spectrum *has to* be approximated with discrete spectrum lines. (EE)

(42) *Let* (A,B)(A,B) be in Brunowski canonical form. (EE)

These directives allow both precision and an economy of expression highly valued by information saturated scientists who often read rapidly with an interest in uncovering findings relevant to their own research. Textual acts, which direct readers to a table or citation rather than instruct them how to understand an argument, have increased in all fields, suggesting a more cautious approach to rhetorical engagement and a tempering of authorial efforts to bring readers into alignment with their position. The increase in textual acts may also, of course, indicate changes in preferred argument patterns, with a greater reliance on intertextual referencing and tabular data.

10 Some speculative conclusions

In this paper we have sought to catalogue the changes which have occurred in engagement practices in research writing over the past 50 years. Using Hyland's model and looking at the papers from leading journals in four representative disciplines, we have found that writers in all disciplines now use more of these explicit markers of engagement than in the past but that these increases have not kept pace with the fact of longer articles. Applied linguistics and sociology employ 30% fewer de-

vices than before when corrected for text length, with substantial drops in asides, knowledge reference and reader-mention. Frequencies in biology have remained fairly stable but electrical engineering has bucked the trend in other fields by seeing a huge rise in directives, more than doubling the number of textual acts. These seem to be important, but largely unnoticed, changes which have resulted in a gradual adjustment of argument profiles to accommodate changing circumstances.

The most significant change is the decline in the extent to which writers in the soft knowledge fields now engage with readers. Although never as important in argumentation as stance, with around one eighth of the devices compared with stance markers (Hyland, 2005), engagement has nevertheless been an important element of the social scientist's rhetorical armoury. It seems, however, that research is now being reported more impersonally and with less explicit effort to finesse the reader. This is not to say that writers are no longer crafting texts which take the processing needs and background knowledge of their readers into account, but that that this is now being done with less obvious authorial intervention. Speculatively, this may be due to the increasing specialisation of research in the social sciences for, as topics become more focused and the literature more concentrated, audiences are themselves becoming more specialised. Academic success ever more demands that professional academics carve out a very particular niche for themselves and make a contribution to a narrowly specific area. This means audiences are more familiar with issues and perhaps writers have less need for explicit engagement to persuade them.

Biology and electrical engineering, on the other hand, seem to be moving in the opposite direction, although the changes have been less dramatic and largely the result of increases in directives. Traditionally, the relatively clear criteria for establishing or refuting claims has allowed authors to keep their data at arm's length and let their results apparently do the talking. A 9% rise in engagement features per 10,000 words, however, suggests the beginning of an authorial repositioning, perhaps not unrelated to the need to address audiences beyond an immediate group of informed insiders to promote both one's research and oneself with tenure and promotion committees and with commercial sponsors. The heavy fall in references to shared knowledge and asides indicates less confidence

in the ability of readers to recover insider allusions and increases in directives greater attention to clear guidance of readers perhaps unfamiliar with arcane practices or knowledge.

Pedagogically, we would hesitate to advise EAP teachers to scratch engagement markers from their classes on the grounds that they are declining in professional academic genres. The decline is glacial and they remain an important aspect of scholarly persuasion. Such changes, however, can help illustrate that academic discourse conventions are not monolithic and unchanging, but are responsive to changing circumstances. They might also offer EAP instructors fruitful topics for discussion or investigation with their students in specific fields, contributing to their awareness of these key rhetorical features of academic persuasion and how they are routinely expressed in their own disciplines.

In the end, writers' decisions about interpersonal intrusion is an individual matter, influenced to some extent by a preferred writing style, but such decisions need to recognise and align with both disciplinary epistemologies and social practices as well as with wider social changes. The most significant of these in recent times would seem to concern the ways knowledge is constructed and disseminated to new audiences, although these tentative conclusions should be strengthened and confirmed with further research into these features.

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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 -)

Appendix 2: Engagement features

(1) Reader mentions

your

Your

you

You

one's

One's

the reader

The reader

We

Our

Us

our

reader

Reader

(2) Questions

?

(3) Appeals to shared knowledge

apparently

as a rule

common

commonly

conventional

conventionally

established

familiar

normally

obvious

obviously

of course

prevailing

prevalent

traditional

traditionally

typical

typically

usual

routinely

(4) Directives

add

allow

analyse

analyze

apply

arrange

assess

calculate

choose

classify

compare

connect

consult

contrast

define

demonstrate

determine

do not

develop

employ

ensure

estimate

evaluate

follow

go

have to

review

increase

input

insert

integrate

key

let us
look at
mark
measure
mount
must
need to
ought
observe
order
pay
picture
prepare
recover
refer
regard
remember
remove
see
select
set
should
show
suppose
state
think of
turn
use
take
consider
find
imagine
let
let's
note
notice
assume
think about

recall
remember
let us
let's
let
need to
should
ought to
do not
have to
must
has to
(regular expression query)
it is adj. to V.
`it_PP\s\s_VBZ\s\w*_JJ\sto_TO\s\w*_VV`
imperatives
`(\(\(\s|._SENT\s)\w*_VV`

(5) Asides

incidentally
by the way
(
—