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How do British and Japanese scientists use "*we*" and verbs in biology, chemistry and physics papers?

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This study intends to analyse type and tense of verbs with "we" in British and Japanese scientists' research articles in English. This is to examine non-English speaking scientists'difficulties in emphasising their role and their findings in their published work. I compared 30 papers in the three fields (14 British and 16 Japanese in physics, chemistry and biology) to distinguish differences in relation to the field.

The analysis indicated not only a variety among the writers but also some general tendencies among the scientists in each field. For example, physics papers tended to use "we" much more than chemistry and biology papers, and most of the papers analysed used "we" in the last paragraph in the introduction. However it also showed subtle differences between the British and Japanese papers, which indicate possible disadvantages for Japanese scientists. For example, first, the British often combined two verbs with "we" such as "we want to investigate..." to emphasise the writers' role in conducting research. Second, only Japanese combined "we" with "confirm" while the British used only inanimate subjects such as "this study" for "confirm". The findings suggest that the both British and Japanese share the intention but differ in its linguistic realisation, which seems to be related to the attention paid to the type of verbs to go with "we", to maximise the effect of "we" in their research articles.

1. Introduction

Although writers' language and cultural backgrounds may affect their writing (Clyne, 1987; Golebilowski, 1998; Mauranen, 1993; Martin, 2003; Moreno, 1997, for example), we need to be aware that writing is influenced by other factors such as the readership (Peterson and Shaw, 2002) and type of writing such as writings for researchers or those for practitioners (Hemais, 2001) and disciplines (Hyland, 1999). Working in the same discipline such as science, writers share the norms and expectations about the use of linguistic forms, regardless of their nationality and language

backgrounds. However, in a discipline with a wide variety of fields like science, norms of linguistic forms may vary with fields. We cannot simply attribute differences to writers' language or cultural backgrounds. Therefore, when we analyse academic texts written in English by English and non-English writers in the same discipline, prior to the comparison of English and non-English writers' writing, it seems necessary to examine both common usage of linguistic forms and diversity of their use due to field differences.

The shared knowledge of linguistic features among the researchers in science may be associated with impersonal sentence construction based on the positivist ideology (Bazerman, 1988; Swales, 1990). Based on the examination of active verbs in 16 articles in physical sciences, Rodman (1994) categorised subjects into 5 types (p. 315) and examined their frequency. She found that the most frequently used subject was real world subject (32%) such as *alkaline granites*, which corresponds to the impersonal and objective nature of scientific discourse. However, human subjects such as *Smith, we*, were the second most frequently used type. Among them, 37% were the pronoun "we" although she agreed that "there was considerable variation in the use of the personal pronoun "we" from article to article." (p. 317). It seems that writers of scientific research articles are not simply creating objective fact centred scientific argument, but using "we" for drawing attention from readers on their personal perspective. Referring to Gosden's work (1993) on the analysis of subjects in scientific texts, Rodman (1994) describes the role of "we" as a device to provide maximum visibility and implied authority of the writers.

The frequent use of "we" in one location also seems to support its rhetorical use; Rodman (1994) found that 5 of 9 active voice structures in her corpus were used in the last paragraph in the introduction where writers are most likely to present the purpose and the main research question—Move 3 "occupying the niche" in Swales' terms.

It seems that while impersonal sentence construction is described as a rhetorical means to shift responsibility from a human agent to factual data, "we" is also part of rhetorical devices to emphasise the writers' achievement and ownership of the findings in research articles (Rodman, 1994). The difference between English and non-English speaking writers may lie in the way they describe and emphasise their findings in the use of "we" and verbs.

A similar argument was proposed by Tarone et al. (1981, 1989) who found that "we" plus an active verb occurs as frequently as the passive in two astrophysics journal articles. They showed that the first

person plural active "we" form was used to indicate points in the logical development of the argument where they have made a unique procedural choice. By supporting intentional use of "we", Gosden (1993) shows that personal pronouns referring to authors appear most often in the introduction and discussion sections, which are the most rhetorically charged parts of research papers (Hyland, 2001).

To analyse a rhetorical feature of "we" any further, it seems necessary to clarify the meaning of "we" as it can refer to either to readers and writers (inclusive "we") or writers only (exclusive "we") (Quirk, Greenbaum, Leech & Svarvik 1985). Through the analysis of computer science papers, Kuo (1999) found that 65.5% of the use of "*we*" in the analysed papers was exclusive use. In scientific texts, exclusive "we" may be a dominant pattern of use (Kuo, 1999; Hyland, 2001).

Hyland (2001) focused on the analysis of exclusive "we" in academic texts of various disciplines and showed that humanities papers used more personal pronouns than those in scientific papers. However, he also pointed out that "*although writers in the hard sciences were less explicitly present in their texts, they were not invisible.*" (p. 217). His view on the use of "we" was similar to that of other researchers (Rodman, 1994; Tarone et al., 1981, 1998) pointing out that "we" was used as a device to strengthen writers' role in research and gain credit for their work.

"We" can also have hedging effect to make the claim more tentative (Martinez, 2001). The difference in the effect of "we" may depend on the choice of verbs to accompany "we". It seems that we need to examine "we" in relation to its accompanying verbs in research articles to understand how writers maximise the effect in the use of "we" on readers.

Reporting verbs has been studied to examine how writers evaluate previous studies and present their own findings through the use of tense (Gunawardena, 1989; Salager-Meyer, 1992) or that of type (Hyland, 1999, 2001; Thomas and Hawes, 1994; Thompson and Ye, 1991).

Hyland (1999) compared the disciplinary differences across various disciplines such as arts, social sciences, natural sciences in the use of citation forms and that of reporting verbs. He categorised the reporting verbs according to the type of activity into three, which was based in the findings of Thompson and Ye (1991) and Thomas and Hawes (1994);

(1) Research (real-world) Acts, which occur in statements of findings (*observe, discover, notice, show*) or procedures (for example *analyse, calculate, assay, explore*);

(2) Cognitive Acts, concerned with mental processes (*believe, conceptualize, suspect, view*);

(3) Discourse Acts, which involve verbal expression (*ascribe, discuss, hypothesize, state*) (Hyland, 1999, p. 149)

Hyland's study (1999) showed that engineering and scientific papers favoured research act verbs while social science papers display a liking for discourse act verbs. Disciplinary principles seem to affect choice of reporting verbs employed with "we". In order to clarify how scientific fields and writers' language backgrounds influence writing, this paper examines the choice of verbs with "we" by English and non-English speaking writers in three scientific fields. I will address the following questions.

1) Is there a wide difference in its use?
2) What are the common features in the use of "we" and verbs?
3) Are there any differences in the use of "we" and verbs in relation to the field and type of articles?
4) Are there any differences between British and Japanese papers in the use of "we" and verbs?

3. Data collection and data analysis.

I chose research papers only from American journals to avoid any differences due to the influence of publishing instituion of the journals. The criteria for identifying British and Japanese papers were writers' affiliation and/or names of the writers. As there are many collaborative work between two institutions, I avoided papers as a result of collaboration between English speaking countries and Japan.

The details of the anlaysed papers are as follows. Chemistry and biology papers were experimental while physics papers were theoretical.

Field	Number of papers
chemistry	7 (3 British papers and 4 Japanese papers)
biology	12 (7 British papers and 5 Japanese papers)
physics	12 (5 British papers and 7 Japanese papers)

It has to be mentioned that as Thomas and Hawes (1994) acknowledge the difficulty in categorising some of the reporting verbs, some verbs may belong to two types such as "show" and "demonstrate" These verbs may belong to research act verbs as they show research process and may also discourse act verbs when presenting a result. Thus it seems necessary to show examples rather than simply counting numbers. In this study I categorised "show" and "demonstrate" as discourse act verbs

because the combination of "we" and these verbs carry a verbal aspect of reporting.

4. Findings.

4.1. The number of "we".

Although scientific norms may expect research articles to be impersonal (Bazerman, 1988), in these papers from the three fields, both British and Japanese papers analysed here used "we" as shown below, indicating a great variety in the use of "we" in research articles in three fields. As shown in table 1, although a vast difference in the number of "we" in papers makes it difficult to average the number of use of "we" per paper, it can be said that physics papers tended to use "we" more than those in chemistry and biology.

Table 1 Number of " we " in research articles.

Fields/nationality	British papers (no. of we)	Japanese papers (no. of we)
Chemistry	9	5
(3 British and 4 Japanese	17	4
papers)	49	14
		5
Biology	2	8
(7 British papers and 5	18	1
Japanese papers)	13	4
	4	6
	11	33
	9	
	19	
Physics	14	17
(5 British papers and 7	25	16
Japanese papers)	20	5
	15	4
	65	18
		38
		96
Total	288	282

4.2. Common features in the use of "we" and verbs among the three fields.

4.2.1. Inclusive vs. exclusive use of "we"

The dominant use of "we" seems to be exclusive use, i.e. reference to the writers. British papers used 6 of 288 use of "we" for inclusive use while Japanese papers used 5 of 282 use of "we" for inclusive use. Interestingly all appeared with "see" such as "we can see ..." and "we have seen..." to refer to the results presented in both papers.

In order to identify the role of "we" as a rhetorical device in scientific research articles, the place of "we" was also examined.

4.2.2. Location of "we".

As was shown by Rodman (1994), when papers had "we" in the introduction, they were most likely to use it in the last paragraph as shown in Table 2.

Table 2

Nationality of papers	No of papers analysed	No of papers with "we" in the introduction	No of papers with "we" in the last paragraph in the introduction
British	15	10	7
Japanese	16	13	12

Although some of the papers used "we" in the first or last paragraphs of results or discussion sections, the comparison was not possible as the introduction is the only section all the papers had. Some papers had IMRD sections but others put results and discussion sections together or had conclusion section at the end.

4.2.3. Functions of "we".

Because exclusive "we" seems to play multiple roles in research articles, I categorised them into four types: meta-discourse, self-citation, personalisation, and emphasis, (see examples). Meta-language refers to sign posting and to their claim in their paper such as "We have found ..." (British paper in chemistry) and "We have explored ... " (Japanese paper in chemistry), while self-citation refers to writers' own previous work with the use of an adverb such as "We have recently described..." (British paper in chemistry). The difference between personalisation and emphasis is that the former refers to the role of researchers in one research activity and the latter express some emphasis on the role of researcher in research activity. The former example is "We put ..." (Japanese paper in physics), and the latter is "We would like to stress..." (British paper in physics). These examples suggest that functions of "we" should be related to tense and type of verbs. It seems that we need to examine both "we" and its accompanying verb.

4.2.4. Type of verbs with "we".

Verbs employed with "we" was categorised according to the three types (research act, discourse act and cognitive act, see Hyland 1999, p. 149). As shown in table 2, the majority of verbs employed with "we" in the three fields belonged to research act verbs such as "examine" and "found".

Table 3 The difference in the use of type of verbs with "we" can be shown according to the fields.

Field	Research act verbs	Discourse and cognitive act verbs	Total
Chemistry	56(Brit)+30(JP)=86 (74%)	19(Brit)+6(JP)=25 (26%)	111
Biology	56(Brit)+44(JP)=100 (79%)	18(Brit)+8(JP)=26 (21%)	126
Physics	114(Brit)+167(JP)=281 (84%)	25(Brit)+27(JP)=53 (16%)	333
Total	226(Brit)+241(JP)=467 (82%)	62(Brit)+41(JP)=103 (18%)	570

Although discourse and cognitive act verbs were in the minority, as these types may work against impersonal nature of scientific discourse, it is interesting to examine which verbs can be combined with "we" in scientific discourse. The discourse and cognitive act verbs and their number of use according to the field and the nationality of writers were shown in table 4.

Table 4

Fields	Nationality	Discourse and cognitive act verbs in non-finite form (No.)
physics	British	discuss (2), not know (1), assume (7), consider (7), describe (1), remember (1), call (2), speak of (1), argue (1), believe (1), explain (1)
	Japanese	mention (2), consider (2), believe (2), expect (1), present (1), describe (2),discuss (7), assume (2), remark (1), not know (1), report (1), propose (1), review (3), conclude (1)
biology	British	argue (1), suggest (3), show (3), conclude (3), not know (2), demonstrate (1), consider (1), present (1), speculate (1), describe (1), propose (1)
	Japanese	report (2), present (1), not know (1), thought (1), demonstrate (1), show (1), believe (1)
chemistry	British	address (1), consider (5), believe (1), report (2), conclude (2), not understand (2), discuss (1), propose (5)
	Japanese	infer (1), conclude (1), demonstrate (1), report (1), discuss (1), assume (1)

Table 4 shows that all the discourse and cognitive act verbs except a few were used less than five times in each field. Only a few verbs were used across the fields such as "consider", "conclude" and "propose". Thus many types of discourse and cognitive verbs were used but they have very few token number. It is interesting to note that "know" and "understand" only appeared in negative sentences such as "we do not know...", to acknowledge the limitation of the study. Some cognitive verbs seem to be used to hedge the strength of a claim.

Next we focus on the differences in the use of verbs accompanying "we" in the three fields.

4.3. Differences among the three fields.

The table 5 shows that the fields and type of papers (experimental or theoretical) seem to influence the number of "we" and tense of verbs with "we". First, theoretical physics papers used "we" most

(333) followed by biology (128) and chemistry papers (103), which supports Tarone's hypothesis that theoretical papers tend to use more "we" than experimental papers. Second, among the experimental papers, biology papers seem to use more past forms than chemistry papers. More than a half of verbs with "we" were used in past tense (76/128) in biology papers. Third, auxiliaries were mostly used by physics papers, which again supports the hypothesis of Tarone et al (1981, 1998).

Table 5 British and Japanese papers' use of verbs with "we" according to tense and field.

Fields	biology (No of papers)		chemistry (No of papers)		physics (No of papers)		total
tense	British papers (7)	Japanese papers (5)	British papers (3)	Japanese papers (4)	British papers (5)	Japanese papers (7)	(31)
Present + (present continuous)	23(1)	1	35(1)	4	70(1)	124(1)	257(4)
Past	28	48	5	26	6	24	137
Present perfect	17	3	25	6	14	15	80
Auxiliaries	5	0	9	0	48	30	92
Total	74	52	75	36	139	194	570

Table 6 presents examples of verbs with "we" employed more than five times in each field; each tense form is treated as one i.e. "find" and "found" counted as two words. Table 6 shows that the tense of verbs corresponds to the dominant tense in each field.

Table 6 Verbs employed more than five times in each field.

field	British papers (no of use)	Japanese papers (no of use)
Chemistry	Propose (5) Analysed (5) Found (5) Find (11)	No verbs were used more than five times.
Biology	Investigated (5) Examined (5) Determined (5) Observed (5) Have provided (5)	Examined (6) Identified (6) Used (8)
physics	Have (7) May/will assume (5) Study (5)	Point out (5) Investigate (5) Have (44) Characterise (5)

Scientific fields seem to affect type and tense of verbs with "we". However, on a close examination, we can also see differences between British and Japanese papers.

4.4. Differences between British and Japanese papers in the three fields.

The first difference was the use of tense. As summarised in table 7, across the fields Japanese writers tended to use more past tense than British in all these three fields, in particular in chemistry, while the British researchers used more than twice as many present perfect forms (57) as the Japanese researchers (24).

Table 7

Tense / nationality	Number of use of present	Number of use of past	Number of use of Present perfect	Number of use of auxiliaries
British papers	133	39	56	62
Japanese papers	127	90	24	30

The difference in tense can also be found among verbs with "we" employed in the last paragraph of the introduction where the majority of the analysed papers used "we". Japanese used 6 of 12 verbs with "we" in past tense while British used only one of 10 verbs in past tense i.e. "we sought to improve..." This British use of one verb in past tense leads to another example of difference.

The second difference was that British tended to combine two verbs such as "we sought to improve..." as shown above, which may emphasise their intention and purpose. Although Japanese papers also used this pattern (7 token numbers), they used much less than the British (18 token numbers) as shown in Table 7.

Table 8 **British and Japanese use of two-verb construction.**

British examples (number of use)	Japanese examples (number of use)
We are able to (3) We will attempt to (1) We wish to (1) We want to (5) We decided to (2) We sought to (1) We need to (3) We have to (1) We are interested in (1)	We succeeded in (1) We attempt to (2) We are ready to (1) We have to (2) We would like to (1)
Total number: 9 types and 18 tokens	Total number: 5 types and 7 tokens

The third difference was the use of "we" with "confirm"; "we + confirm" only appeared in the results section in 4 Japanese papers. Although British also used "confirm", they combined it with inanimate subjects such as "this study" or in passive voice instead of "we".

5. Discussion.

5.1. Individual differences and common features among the three fields.

The results of this study have shown a wide variety of the use of "we" among the writers in the three fields, which indicates no strict rule to discourage its use in these fields.

However, working on the same scientific discipline, obviously they share some features in the use of "we" and accompanying verbs. As the last paragraph in the introduction corresponds to the third move in Swales' move analysis, i.e. to introduce the writer's current work, the common use of "we" in the last paragraph, as was also found by Rodman (1993), supports the writers' use of "we" as a rhetorical device. "We" seems to be used to shift attention from findings of previous studies to writers' own work in the last paragraph. "We" seems to be empoloyed to clarify and emphasise the agent of research activities. However, although not so common, writers may use cognitive verbs with "we" to acknowledge the limitations of the claim, which was shown in the use of "know" and "understand" with "we" in negative sentence. Writers seem to use "we" and verbs to balance the strength and weakness of their argument, according the norms of the field.

5.2. Differences across the fields.

Subject fields and type of studies i.e. experimental or theoretical, seem to affect the use of "we" and the tense of accompanying verbs. Theoretical physics papers used more "we" than experimental papers and tended to use the accompanying verb in present tense, which was also pointed out by Tarone et al. (1981, 1998). By the same token, to present the findings, experimental papers in chemistry and biology had more use of past tense with "we" than theoretical papers. Also "we" seems to be much more common in physics papers than chemistry and biology papers. To emphasise findings, writers of research articles need to pay attention to not only the use of "we" and the tense of verbs employed with "we" in their field. At this stage it is difficult to present any reason why chemistry papers had slightly more present tense verbs than biology papers.

Being a professional in the field, Japanese writers employ "we" as British writers do but we still seem to find subtle differences between them. This study has shown differences in the use of type and tense of verbs with "we".

5.3. Differences between British and Japanese papers.

The combination of verbs and subjects showed differences in the way they maximise the role of "we" in scientific texts. The first example is the two-verb construction used mainly by British writers which enables writers to highlight their intention and their active role in decision making process in conducting research.

Second only Japanese writers used "we" + "confirm". "confirm" is certainly an important verb to be used in research articles as it draws attention to the fact that writers found the same results as others. However, if "we" is used to emphasise writers' unique contribution to the discourse community, "confirm" may not be the most suitable verb to use with "we". It is interesting that British combine it with inanimate subjects such as "this study". This tendency to use "confirm" with "we" by Japanese writers may be related to their cultural background in which people are educated to confirm to the expected social norms (Nakane, 1970). Japanese writers may find more value in finding the results similar to previous results than British as they emphasise "confirm" with the use of "we".

Third, Japanese papers differed from British ones in number of the use of present perfect and past. Past may be related to language difficulties pointed out by Gunawardena, 1989. However, the frequent use of past by Japanese may be more complex than language problems. Because past tense seems to be the norms to present writers' research findings (Burrough-Boenisch, 2003), Japanese writers may be following the norm. By contrast, British may be deviating from the norms to emphasise their findings.

Thus although both British and Japanese combined "we" with all types of verbs in their research articles, its combination with verbs can create a different effect on readers. These differences seem to be related to their awareness of the functions of "we". British writers tend to use it as a rhetorical device while Japanese writers are less likely to explore its rhetorical role in emphasising their findings. To draw attention from readers to the findings and to emphasise the work, British pay attention to type and tense of verbs to combine with "we".

6. Conclusion and implications.

This study has examined the shared and non-shared aspects of the use of "we", tense and type of verbs to go with "we" due to the field and the mother tongue in biology, chemistry and physics

papers written by British and Japanese writers. The findings suggest that we should not attribute differences simply to the mother tongue of the writers. Working in the scientific discourse community, British and Japanese writers share the norms for the use of linguistic forms across the three fields. For example, they used "we" with research act verbs most and they often put "we" in the last paragraph in the introduction section. The common location of "we" shows its rhetorical role of shifting attention to to the writers' work.

However, writers' fields seem to affect the use of "we" and tense of verbs with "we". It is interesting that theoretical papers used "we" and present tense of verbs with "we" most. Although the differences may be subtle, we need to be aware that each field has its own use of "we" and verbs. We cannot simply transfer the use from one field to another just because both are in the same discipline.

The differences also appeared between British and Japanese use of "we" and type and tense of verbs. British seem to be more concerned with rhetorical effect of "we" on readers, while Japanese tend to follow the norms of the discipline and language faithfully.

Obviously as number of the analysed papers is limited, further studies are necessary to clarify the difficulties Japanese scientists have. However, the information of the difference helps Japanese writers to construct persuasive scientific argument, as they would pay more attention to type and tense of verbs to combine "we" in both reading and writing papers in their field. In fact, the change in reading practice may have positive effect on their writing. It would be useful to examine to what extent Japanese scientists are aware of the combination of subjects and verbs in scientific research articles in English. Also if they are not aware, they may be helped to construct a more persuasive argument by the knowledge of the use of tense and type of verbs with "we".

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